RD 6 IV 1990

/74 B

THE LONDON NATURALIST

the journal of the
LONDON NATURAL HISTORY SOCIETY

No 58

Published 1979
Price £2.50 post free

LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 32 km (20-mile) radius of St Paul's Cathedral and here most of its activities take place. Although much is covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society consists of sections whose meetings are open to all members without formality. For those interested in archaeology, botany, conservation, ecology, entomology, geology, ornithology or rambling there is a section ready to help.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The London Bird Report, published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the *London Natural History Society Newsletter* and the *Ornithological Bulletin*, are sent to members throughout the year.

Indoor meetings

These are held in most weeks throughout the year with lectures, discussions, colour slides and films on all aspects of natural history.

Field meetings

Led by experts to visit interesting natural history localities, many outside our Area. These excursions are very popular with beginners wishing to increase their knowledge and enable members to get to know one another.

Library

A large selection of books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

Reading circles

Many important natural history journals are circulated by the sections at a fraction of the cost of subscribing direct.

SUBSCRIPTIONS

ORDINARY MEMBERS	£6·00
JUNIOR MEMBERS	£3·00
FAMILY MEMBERS	£1·25

The entrance fee is £0·50. Junior membership is for persons under 18, or under 25 if receiving full-time education. All except family members receive one free copy of *The London Naturalist* and the *London Bird Report* each year. Cheques and postal orders, payable to the London Natural History Society, should be sent to:

The Membership Secretary, Mrs B. F. Barrett,
21 Green Way,
Frinton-on-Sea, Essex CO13 9AL

THE LONDON NATURALIST

Back numbers of *The London Naturalist* are available as follows:

No. **39** (1960) — **47** (1968); **49** (1970) — **52** (1973): £1 each post free. No. **48** (1969): £0.50 post free. No. **53** (1974) — **54** (1975): £1.50 post free. No. **55** (1976) — **58** (1979): £2.50 post free.

These, and back numbers of the *London Bird Report*, may be obtained from the Publications Sales Secretary, Mrs H. M. Housego, 110 Meadvale Road, Ealing, London W5 1LR. Reprints of the Index to *The London Naturalist* **32 – 51** are available for £0.25 post free. Reprints of the *Annual Rainfall Overlay*, *Master Grid Overlay*, *Habitat Overlay*, *Regolith Overlay* and *Air Pollution Overlay* are £0.10 each post free.

LIBRARY

THE LONDON NATURALIST

the journal of the
LONDON NATURAL HISTORY SOCIETY

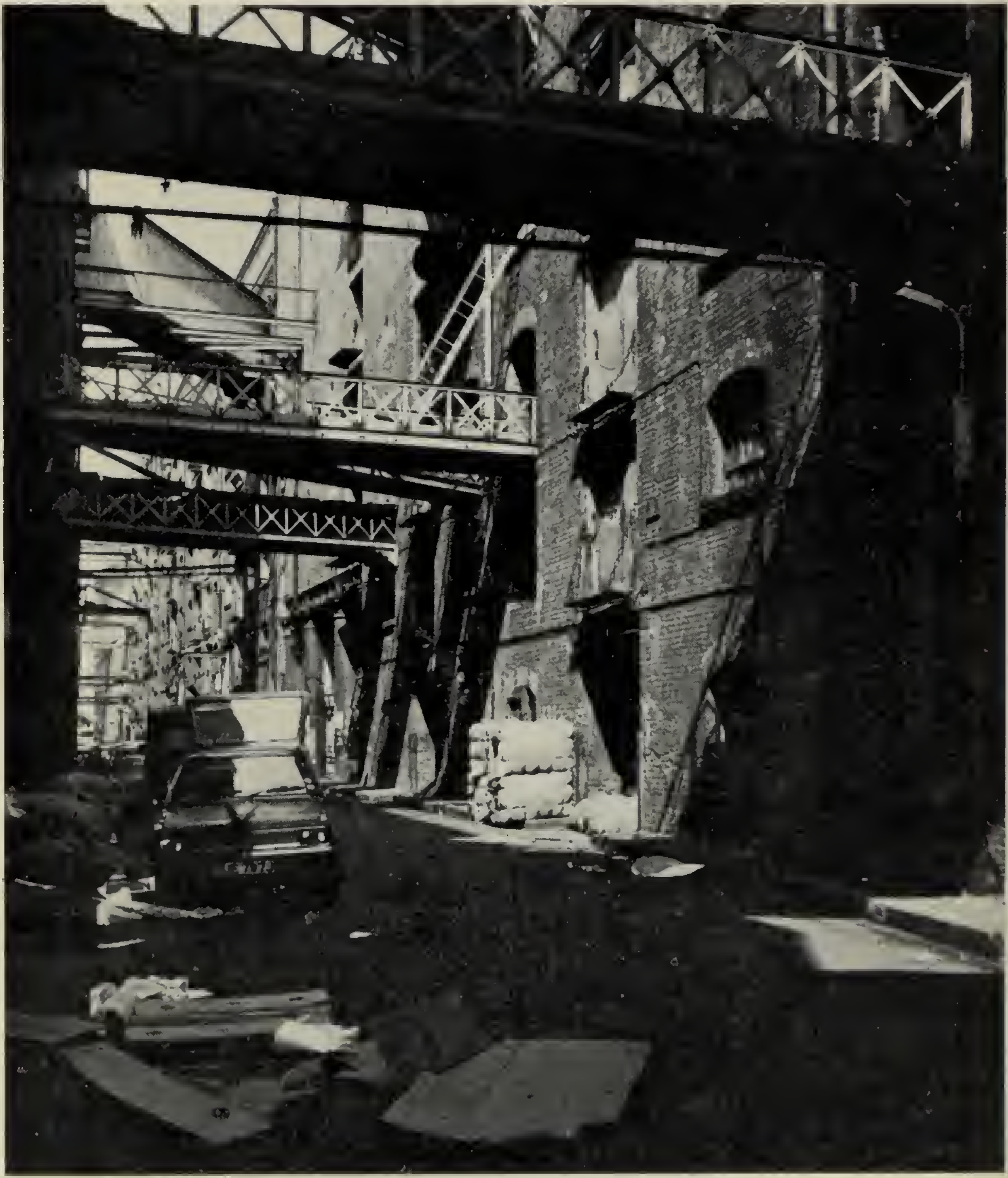
No. 58

for the year 1978

Edited by J. R. Laundon
with the assistance of
R. M. Burton and K. H. Hyatt

ISSN 0076-0579
World List abbreviation: *Lond. Nat.*

Published November 1979
© London Natural History Society 1979, London
Printed by F. H. Brown Ltd., Sandygate Mill,
Burnley, BB11 1RP



Shad Thames. Towering Victorian warehouses in Bermondsey (London Borough of Southwark), characteristic of the Pool of London. These warehouses have a specialised fauna, including the ship rat *Rattus rattus* and the black redstart *Phoenicurus ochruros*. The associated London Docks on the north side of the Pool in Wapping and the Surrey Commercial Docks to the south in Rotherhithe, both now derelict, are proving to be notable habitats for many forms of wildlife: they merit special study before their interest is lost through redevelopment. Photograph: J. R. Laundon, April 1978.

LONDON NATURAL HISTORY SOCIETY

Founded 1858

President:

D. J. Montier

6 Cloonmore Avenue, Orpington, Kent

Honorary Vice-presidents:

E. B. Bangerter, F.L.S., Miss E. Brown, B. L. J. Byerley, F.R.E.S., B. Campbell, PH.D., S. Cramp, O.B.E., B.A., F.Z.S., M.B.O.U., R. W. Hale, P. C. Holland, Eric Hosking, O.B.E., F.R.P.S., M.B.O.U., Miss C. E. Longfield, F.R.G.S., F.R.E.S., M.B.O.U., E. M. Nicholson, C.B. LL.D., M.B.O.U., R. M. Payne, F.R.E.S., Mrs L. M. P. Small, Prof. E. H. Warmington, M.A., F.R. HIST. S.

Officers for 1979

Vice-presidents: A. J. Barrett, G. Beven, M.D., B.SC., F.Z.S., M.B.O.U., R. E. Butler, B.SC., F.G.S., V. F. Hancock, M.B.O.U., K. H. Hyatt.

Secretary: J. B. Cresswell, F.R.A.I., DIP.ARCH., 142 Harborough Road, Streatham, London SW16 2XW.

Treasurer: Miss M. P. Brown, 28 The Plantation, Morden Road, Blackheath, London SE3 0AB.

Membership Secretary: Mrs B. F. Barrett, 21 Green Way, Frinton-on-Sea, Essex CO13 9AL.

Library Secretary: Miss J. Hardy, 140 Hamilton Avenue, Tolworth, Surbiton, Surrey KT6 7PZ.

Publications Sales Secretary: Mrs H. M. Housego, 110 Meadvale Road, Ealing, London W5 1LR.

Editor, *The London Naturalist:* J. R. Laundon, F.M.A., 14 Victory Avenue, Morden, Surrey SM4 6DL.

Sub-editors, *The London Naturalist:* R. M. Burton, B.A. (Botany), K. H. Hyatt (Zoology).

Editor, *London Bird Report:* K. C. Osborne, M.B.O.U., 8 Ellice Road, Oxted, Surrey RH8 0PY.

Editor, *London Natural History Society Newsletter:* H. J. Milner, 7 Vincent Square, London SW1.

Elected Members of Council: D. Bowman, B.SC., R. M. Burton, B.A., Miss E. M. Hillman, B.SC., Miss A. Lightfoot, P. J. Oliver, Miss J. M. Stoddart.

Representative Members of Council: Mrs O. L. Cassie (Ornithology), Miss M. L. Currie (Ecology & Entomology), Miss R. M. Hadden (Botany), Mrs S. Joy (Nature Conservation), Miss H. M. Smith (South-west Middlesex), Miss J. Williams (Geology & Archaeology), Miss D. E. Woods (Ramblers).

Contents

Frontispiece: Shad Thames 2

Officers for 1979 3

Report of the Society for 1978 5

Pleistocene birds from Swanscombe, Kent—C. J. O. HARRISON 6

Bidens in Britain—R. M. BURTON 9

The ground arthropods of London gardens—B. N. K. DAVIS 15

The common wall lizard *Podarcis muralis* in Middlesex—D. STILES 25

The status of the hedgehog *Erinaceus europaeus* in the London Boroughs of Barking, Newham, Redbridge and Waltham Forest—C. W. PLANT 27

Survey of Bookham Common: thirty-seventh year

Progress report for 1978 38

A study of *Ruscus aculeatus* on Bookham Common—ELLA M. HILLMAN 44

A further contribution to the Coleoptera of Bookham Common—D. G. HALL 56

Conservation in the London Area 1978—L. M. PEARL SMALL 60

Botanical records for 1978—R. M. BURTON 62

Amphibia and Reptilia in the London Area 1978—PETER W. KING 69

Mammals in the London Area 1978—J. COTTON 71

Obituaries:

Derrick Gordon Hall, 1923 – 1978 74

Richard Constantine Homes, 1913 – 1978 75

Richard Frederick Moorman, 1898 – 1978 76

Statement of affairs at 31 October 1978 78

London Natural History Society Rules 83

Book reviews 8, 26, 37 43, 59, 77 82

Air pollution overlay—HERBERT A. SANDFORD 89

Report of the Society for 1978*

This has been a year of sadness and upheaval: with the loss of a number of senior personnel, either through death or resignation. Important posts have not been filled, and the jobs undertaken by already-overworked Council members. We thank all those who have stepped into the various breaches to ensure the continuance of the Society. To those who have felt it necessary to resign, we warmly thank them for their past services.

Although the general level of inflation is slowing down, it is still affecting the Society, and steps must be taken lest it erode the standards to which we have become accustomed. There is still a need for the Society to ascertain its proper role.

The programme has been full—but, unfortunately, very often, the halls have not. With the high cost of hiring rooms, lack of support for indoor meetings could jeopardise their future. The tragic untimely death of Derrick Hall, the Programme Secretary, was a loss to us in more ways than just the office he held. Keith Hyatt picked up the threads and ensured the smooth running of the programme. We thank him and all the various sectional programme secretaries for their efforts.

The *Atlas of Breeding Birds of the London Area* has proved a success with satisfactory sales and profit. Again, we thank all those concerned. Other publications are being considered, and we await their outcome. We thank the editors and distributors of the Society's journals and newsletters for all their good work.

Membership figures have risen slightly in most categories, but whereas the increase in ordinary members is less than last year, the increase in family and junior membership has nearly doubled.

	1977	1978
Ordinary members	981	1,019
Subscriber members	19	20
Family members	91	106
Junior members	52	65
Senior members	44	45
Honorary members	16	14
Life members	13	13
Total	1,216	1,282

We have been notified of the following deaths during the year: C. Braby, Miss D. M. Brown, P. Carter, G. H. Davies, Miss D. Gower, D. G. Hall, Miss I. Henwood, R. C. Homes, E. Mann and R. F. Moorman.

We thank, as always, Imperial College for allowing us the use of their rooms for meetings; and Mr Whitworth and his staff for the custody of our Library. The Council wishes to thank all those officers and members who have contributed so much to enable the Society to progress in its important work.

---

* Presented at the Annual General Meeting, 9 December 1978.

Pleistocene Birds from Swanscombe, Kent

by C. J. O. HARRISON*

Summary

The High Terrace at Swanscombe, Kent, usually regarded as originating in the Pleistocene Hoxnian interglacial period, has yielded a few bird remains, hitherto undetermined. These have now been identified as cormorant, ? white-fronted goose, ? barnacle goose, shoveler, common scoter, red-breasted merganser, capercaillie, eagle owl, garden warbler and serin.

Introduction

The High Terrace at Swanscombe, Kent, in the lower Thames valley, is chiefly famous as the site of the discovery of an early human skull. In addition Sutcliffe & Kowalski (1976) refer to it as one of the most important British localities for fossil rodents. It has yielded disappointingly few bird bones, and these had remained unidentified. The specimens available in the collection of the Department of Palaeontology of the British Museum (Natural History) have now been examined and identified. Apart from a group of six passerine bones which were associated, the remainder are very fragmentary remains of single bones.

Systematic List

CORMORANT *Phalacrocorax carbo*. Distal part of a left coracoid, proximal end of a left ulna, BMNH nos. A3608 – 9. A. S. Kennard collection. From the Lower Loam, Barnfield Pit. The specimens are a little small and narrow compared with modern specimens and might be those of an immature or juvenile bird.

? WHITE-FRONTED GOOSE *Anser* cf. *albifrons*. Incomplete right humerus, BMNH no. A3614. A. T. Marston collection. From the Middle Gravel, Barnfield Pit. The specimen consists of an incomplete shaft with part of a deltoid crest.

? BARNACLE GOOSE *Branta* cf. *leucopsis*. Ends of a right femur, BMNH nos. A3615 – 6. B. O. Wymer collection. From the Middle Gravel (*Homo* level) E, Barnfield Pit. The specimens are eroded along the prominent edges of the condyles, trochanter and head.

SHOVELER *Anas clypeata*. Incomplete carpometacarpus, BMNH no. A3612. A. T. Marston collection. From the Shell Bed, Lower Gravel, Barnfield Pit.

COMMON SCOTER *Melanitta nigra*. Scapular end of a right coracoid, BMNH no. A4275. Collected by J. D'Arcy Waechter and presented by the London University Institute of Archaeology. Not localised as to stratum. The specimen has the attachment surfaces poorly developed, possibly with slight distortion, and may be from a young individual.

RED-BREASTED MERGANSER *Mergus serrator*. Incomplete left ulna, BMNH no. A3610. A. S. Kennard collection. From the Shell Bed, Lower Gravel, Barnfield Pit. The specimen, which is damaged at the proximal end, is similar in size to that of the female, which is smaller than the male.

---

*Sub-department of Ornithology, British Museum (Natural History), Tring, Hertfordshire HP23 6AP.

CAPERCAILLIE *Tetrao urogallus.* Distal end of a left ulna, BMNH no. A5031. M. A. C. Hinton collection. From Ingress Vale. The specimen is similar to that of the female, which is smaller than the male, but the shaft is a little stouter, and more rounded than on the comparative specimens used.

EAGLE OWL *Bubo bubo.* An incomplete carpometacarpus, BMNH no. A3613. A. S. Kennard collection. From the Lower Loam, Barnfield Pit. The specimen is very incomplete. Like the claw from the pre-Ipswichian stratum of Tornewton Cave (Harrison in press) it resembles the larger, northern form of the species. A tarsometatarsus from the earlier Cromer Forest Bed Series (Harrison 1979) resembles those of the smaller form now occurring in north Africa and the Middle East, but might be referable to an ancestral form common to both.

GARDEN WARBLER *Sylvia borin.* Apparently associated humerus, proximal end of carpometacarpus, proximal end of ulna, scapular end of coracoid, proximal end of scapula, all from the right side, and anterior end of sternum; BMNH no. A3618. A. S. Kennard collection. From the Lower Gravel, Barnfield Pit. The material matches that of *S. borin* in the length of the bones and size of the end structures, but the shafts tend to be a little stouter. We do not know when the living species of the genus *Sylvia* evolved, but Mourer-Chauviré (1975) records the blackcap *S. atricapilla* from the Riss glaciation in two French caves, and refers to Pleistocene material of four other *Sylvia* species, but not to *S. borin.*

SERIN *Serinus serinus.* A right ulna, BMNH no. A3617. A. S. Kennard collection. From the Lower Loam, Barnfield Pit.

Discussion

The Swanscombe Terrace is usually regarded as Hoxnian in age, but it is now recognised that there may have been a substantial gap in deposition between the Lower Loam and Middle Gravel (Sutcliffe & Kowalski 1976), and it has been suggested that the upper part of the Lower Loam might be Wolstonian (Mullender, in Wymer 1974). The bird fauna does not show any obvious differences which might be relevant to the dating.

The occurrence of the bird specimens in the various strata is listed below with the most recent stratum first. The four main strata are those of the Barnfield Pit. The Ingress Vale material has been inserted at what appears to be the appropriate level in the sequence.

Upper Loam	No records.
Middle Gravel	? Barnacle goose in the Upper Middle Gravel. ? White-fronted goose in the Middle Gravel (Upper or Lower not specified).
Ingress Vale	(possibly correlated in time with the earlier part of the above stratum, or with the next stratum). Capercaillie.
Lower Loam	Cormorant, eagle owl, serin.
Lower Gravel	Shoveler and red-breasted merganser in the Shell Bed. Garden warbler.

The bird fauna generally is of a boreal to cool temperate type. The cormorant occurs from subarctic to temperate regions, and white-fronted and barnacle geese are tundra-nesting species, wintering on temperate coastal grasslands. The shoveler is a duck of temperate freshwaters, while the common scoter and red-breasted merganser breed on tundra to boreal waters, and winter in offshore temperate waters. The capercaillie is a bird of coniferous and mixed woodlands. The eagle owl is usually, but not invariably, associated with forest, and the garden warbler is a bird of open woodland with undergrowth, and of scrub. The serin is an exception in having a more southerly distribution at the present time, from the Mediterranean to the Baltic Sea and English Channel; although it occurs sporadically in southern England, it has not colonised it, and it seems likely that a climatic factor, possibly cold or dampness, is involved.

REFERENCES

HARRISON, C. J. O. 1979. Birds of the Cromer Forest Bed Series of the East Anglian Pleistocene. *Trans. Norfolk Norwich Nat. Soc.* **25** : 277 – 286.

HARRISON, C. J. O. in press. Pleistocene bird remains from Tornewton Cave and the Broxham Windmill Hill Cave in south Devon. *Bull. Br. Mus. nat. Hist.* (Geol.)

MOURER-CHAUVIRÉ, C. 1975. Les oiseaux du Pléistocène Moyen et Supérieur de France. *Docums Lab. Géol. Fac. Sci. Lyon* **64** : 1 – 624.

SUTCLIFFE, A. J. & KOWALSKI, K. 1976. Pleistocene rodents of the British Isles. *Bull. Br. Mus. nat. Hist.* (Geol.) **27** : 31 – 147.

WYMER, J. 1974. Clactonian and Acheulean industries in Britain—their chronology and significance. *Proc. Geol. Ass.* **85** : 391 – 421.

Book Review

A Key to the Freshwater Planktonic Rotifera of the British Isles. By Rosalind M. Pontin. Scientific Publication **38.** 178 pp, 145 text figs. Freshwater Biological Association, Ambleside. 1978. £3.50.

This addition to the valuable series of keys to freshwater life published by the FBA will be welcomed by naturalists who have been handicapped by lack of readily available literature on the subject of rotifers. It will not best serve the needs of the "pond-dipper", since (as is clear from the title) it is primarily concerned with the species of open water, but some of those to be found amongst aquatic vegetation are included if part of their lives is spent in open water. The main part of the work, comprising keys to genera (males and females) and to species (females), is preceded by sections on morphology, classification and methods of collection and study. This is a splendid introduction to the subject for the serious student.

P. C. HOLLAND

Bidens in Britain

by R. M. BURTON*

Summary

Notes on the identification of many species of *Bidens* L. (Compositae) and the history of the introduced taxa are given. *B. cernua* L. and *B. tripartita* L. are native plants of wet places. *B. connata* Muhl. ex Willd. and *B. frondosa* L. are aliens, established mostly by canals. *B. connata* has only recently been recognised as British, and its distribution may not yet be fully known; all records so far are from the London Area. Other species have occurred as adventives.

Introduction

The discovery of *Bidens connata* Muhl. ex Willd. in 1977 (Burton 1978), growing at the edge of the Grand Union Canal at Greenford, Middlesex, and the need to distinguish it from the native species of *Bidens,* commonly known as bur-marigolds, make a review of the genus in Britain especially desirable at the present time.

Species

Bidens species have unwinged achenes, which in most species are topped by two to four rigid awns fringed with small bristles (Fig. 1), an adaptation to dispersal by animals. All the species which have occurred in Britain fall into two groups which differ in the general shape of the achenes. None of those with narrow achenes tapered to both ends and not compressed is established in Britain, but *B. pilosa* L. and *B. bipinnata* L. have frequently occurred as wool aliens (Lousley 1961) and I have seen wool alien material of *B. subalternans* DC. collected in Beds. in 1968 and *B. tenuisecta* A. Gray collected in North Hants. in 1972. These are assigned to Sect. *Psilocarpaea* DC. A different species of this section was found, probably from seed dumped in soy bean waste, on a rubbish tip at Stone, West Kent, seen on the London Natural History Society's excursion of 18 October 1975, but the material is too young for further identification. *B. pilosa* has also been recorded on a rubbish tip in South Essex (Jermyn 1975), perhaps originating from birdseed; seed of the similar *B. biternata* (Lour.) Merr. & Sherff has been detected as an impurity in Ethiopian birdseed, identified from plants raised by C. G. Hanson.

All the species with a permanent place in our flora have achenes which are significantly compressed, the widest diameter being perpendicular to the radius of the fruiting head. In this diameter they are wider at the apex than at the attachment. De Candolle (1836) placed these in his section *Platycarpaea;* this contains the type species of the genus and should now be called Sect. *Bidens.* The shape, size and surface characters of the achenes provide the best means of distinguishing these species, not all of which can be identified with absolute certainty in the absence of fruit. Size is linked to the development of the plant, and shape to the packing of the achenes in the head, so it is best to use achenes from near the middle of the terminal head, which are the most typical. Many plants can also be recognised by the leaves, but the general similarity of the leaves of *B. connata* to those of other species has probably contributed to the failure to notice it in this country.

---

* Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent.

The plants with flattened achenes can be further grouped into those with only two strong awns, which terminate the angles, any third or fourth awns being shorter and terminating a faint median rib, and those with four strong awns terminating both the lateral angles and stout median ribs running up the faces of the achene. In the first group come *Bidens radiata* Thuill., *B. vulgata* Greene, *B. tripartita* L and *B. frondosa* L., in the second *B. cernua* L. and *B. connata*. Fruits of the last four are illustrated in Fig. 1.

In Britain *Bidens radiata* is apparently unrecorded, but it occurs locally in northern France and other European countries, and could become established here. The broad and somewhat clustered heads are very densely packed with achenes and relatively long receptacular scales. The achenes are small, exactly cuneiform and very narrow at the base; the retrorse bristles of the angles and the two awns cling very effectively.

The first discovery of *Bidens vulgata* in Britain was reported by Young (1957). The occurrence of several plants together by a lorry park at Croydon, Surrey, suggested that it might have been reproducing itself by seed there, but it did not persist and the site is now built over (Lousley 1976). This North American species is very locally naturalised near the Loire in France (Corillion 1966) and the Agger in Germany (Schumacher 1941) and has occurred in England as a wool alien (Lousley 1961). It is similar to *B. frondosa* in foliage, but has larger achenes without apical cilia and more numerous (10 – 16) spreading outer bracts.

B. tripartita is the commonest *Bidens* in Britain, occurring in a great variety of lowland wet places. A walk by a river in autumn will often result in a large collection of its 'seeds' attaching themselves very readily to socks and trouser-legs by the retrorse bristles on the angles and awns. The name refers to the typical deeply 3-lobed leaves, but plants also occur with the leaves 5-lobed or unlobed. These have been called var. *major* Wimmer & Grab. and var. *integra* Koch, but as they occur mixed with the type they might be better regarded as forms. All types of leaf have a short broad petiole. The achenes (Fig. 1) are most like those of *B. radiata* among the other species mentioned here, but they have a broader base and are not strictly cuneiform, because the angles are slightly convex near the top.

Bidens frondosa is common in North America and has the vernacular name of beggar-ticks. Continental records go back to Krocker (1790: 380), and during the present century it has spread over many parts of Europe. Its increase in Britain has been slower and almost confined to the last 30 years. Older records suggest that it was impermanent except perhaps at a few ports, but the more recent records indicate that is is becoming established by canals, especially in the Midlands industrial area. First records from Warwick were in 1952 (Cadbury *et al.* 1971), from Stafford in 1954 (Edees 1972) and from Worcester in 1962 (Wallace 1964). Surprisingly it did not get detected as an established alien in the London Area until 1964 (Lousley 1965), when it was discovered by J. G. Dony on the borders of Herts. and North Essex at Dobb's Weir on the River Lee. More recently it has appeared in small quantity by the Grand Union Canal in the south-west corner of Herts. (one plant seen on the London Natural History Society's excursion of 20 August 1977; the achene illustrated in Fig. 1 was collected in the same area by Mrs M. V. Marsden in 1978). *B. frondosa* may also be established in Monmouth, where it was found by a canal in 1978 (Ellis 1978). It has also been reported recently as a casual in various counties; it is possible that some of these records refer to *B. vulgata,* which also has completely pinnate leaves with 5 or 3 stalked acuminate segments. *B. frondosa* can be distinguished by its less numerous (6 – 8) spreading outer bracts and more particularly by its achenes (Fig. 1), which are ciliate at the tip between the awns and have antrorse bristles on the angles.

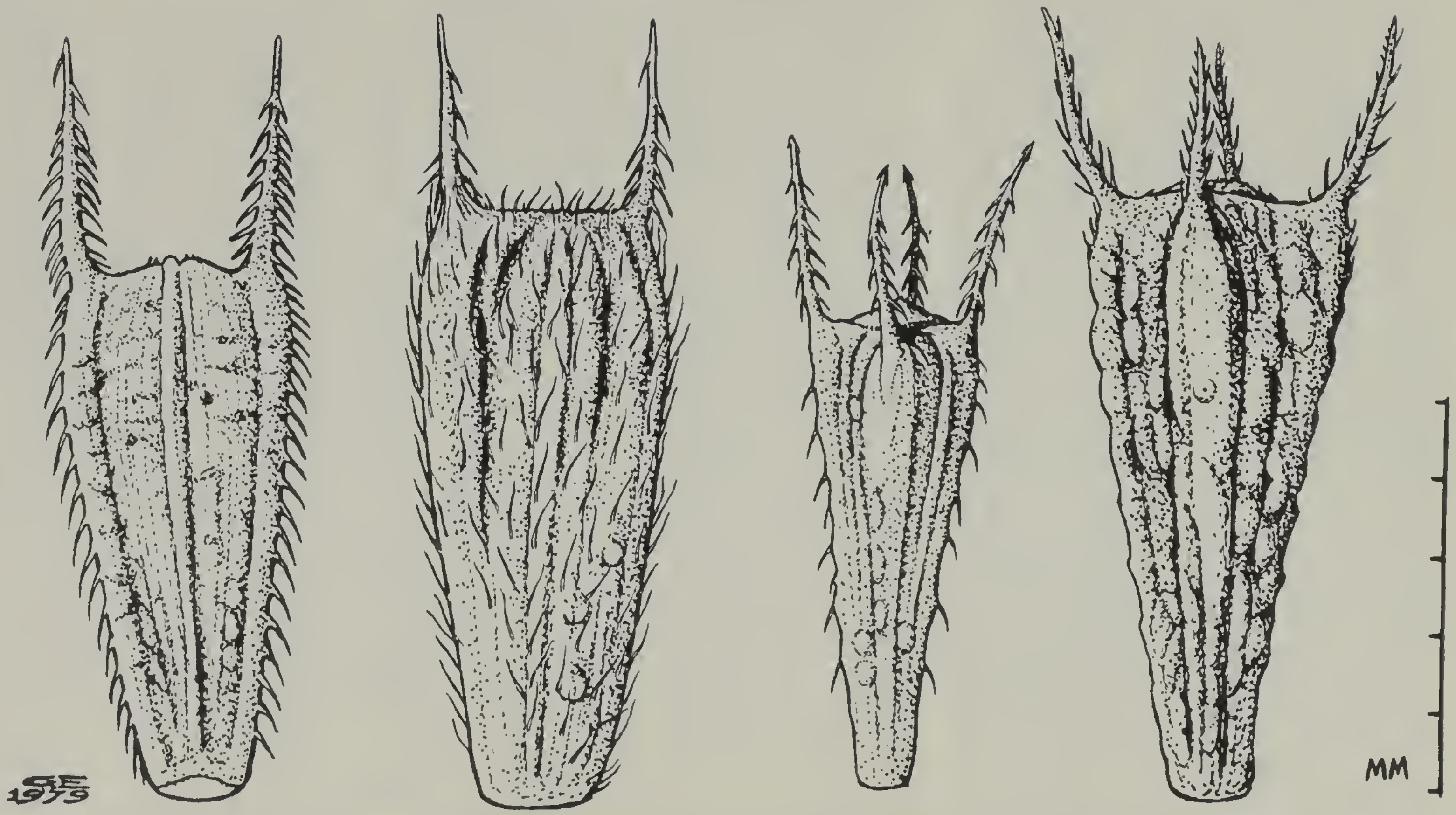


FIG. 1. Achenes of *Bidens* spp. From left to right: *B. tripartita, B. frondosa, B. cernua, B. connata;* scale 5 mm. *B. tripartita* more commonly has a third awn about half as long as the other two.

Bidens cernua is a native species which is almost as widespread as *B. tripartita* in Britain, but is less common in most parts of the country. It must have a wet soil to flourish. In ground which dries out soon after its germination the plant may become starved, and fail to develop the large heads whose weight appears to make the peduncle bend to produce the nodding effect which gives the plant its name. These starved plants have been called var. *minima,* doubtfully based on *B. minima* Huds., but they scarcely deserve a name. A characteristic habitat of *B. cernua* is the margin of a pond whose water-level varies with the seasons; in an average summer the plants will be on mud which was submerged in the previous winter, but in a wet summer they will stand with their stems in the water. Whatever the size of the plant it can easily be told from other species of *Bidens* by its leaf, which is evenly tapered to a base, which, being as broad as the stem, is continuous with the base of the opposite leaf; this is quite unlike the more or less stalked leaves of the other species. The achenes of *B. cernua* (Fig. 1) have retrorse bristles on the marginal angles and awns; the bristles on the angles arise from slight projections of the margin which therefore has a sinuate edge when seen under the lens, unlike all the other species. The achenes also have a characteristic domed apex between the awns, but this is not always easy to observe.

Bidens connata is a North American species whose history on the European continent is similar to that of *B. frondosa.* The oldest record is from Germany in 1885 (Schumacher 1941), and the plant is now occasional by the canals and navigable rivers of the Low Countries and the northern half of France and into Switzerland as far as Brugg on the Aare (Hess *et al.* 1972). A careful search of many stretches of the Grand Union Canal and adjacent waters in the London Area in 1978 revealed plants scattered along the canal (Fig. 2) mostly in Middlesex, with six in four localities on the Slough spur of the canal in Bucks. and more numerous plants by the canal and an adjacent flooded gravel-pit near Rickmansworth, Herts. I am grateful to Mrs M. V. Marsden and Dr J. H. Chapman, who between them found most of these plants by walking along many miles of often dreary towpath. The easternmost group of plants on the map (Fig. 2) was found by myself and seen also by B. Wurzell. Three of the Bucks. plants were found by W. Langham. Dr P. D. L. Maurice had the misfortune to search a long stretch of canal without any *Bidens* at all. I have had no report of *B. connata* from other parts of Britain; nor can I find any evidence that it was present in this country before 1977. On 28 August 1969 I saw a single small plant of a *Bidens* on the towpath near Regent's Park which I could not certainly identify; this I now think was probably *B. connata.* It was not collected and would have made a poor specimen if it had been. There is no *Bidens* at the same locality now.

However, the spread of *Bidens connata* along about 60 km of canal indicates that it has existed there for many years, if it is assumed that all the present plants derive from a single introduction; the evidence to support this assumption is the complete uniformity of the population. All our material has unlobed leaves with a winged stalk, and antrorse bristles on the awns of the achenes (Fig. 1). Some continental plants have this combination of characters, but others have lobed leaves or retrorse bristles. Populations occur which are of mixtures of types. The implication is that the species, like other Compositae, is capable both of out-breeding, as indicated by the existence abroad of rare hybrids, and in-breeding, which results in the perpetuation of the parental combination of characters. If in-breeding were universal the plants would form pure lines of inheritance which could be given names; this seems to be the justification for the use of the name *B. decipiens* Warnstorf in the latest Swiss flora (Hess *et al.* 1972), where the drawing indicates a plant with leaves like ours and retrorse bristles on the awns. In fact it is hard to justify even the use of varietal names such as *B. connata* var. *fallax* (Warnstorf) Sherff for plants with broadly lanceolate irregularly toothed leaves, var. *petiolata* (Nutt.) Farwell for plants with narrower shallowly toothed leaves

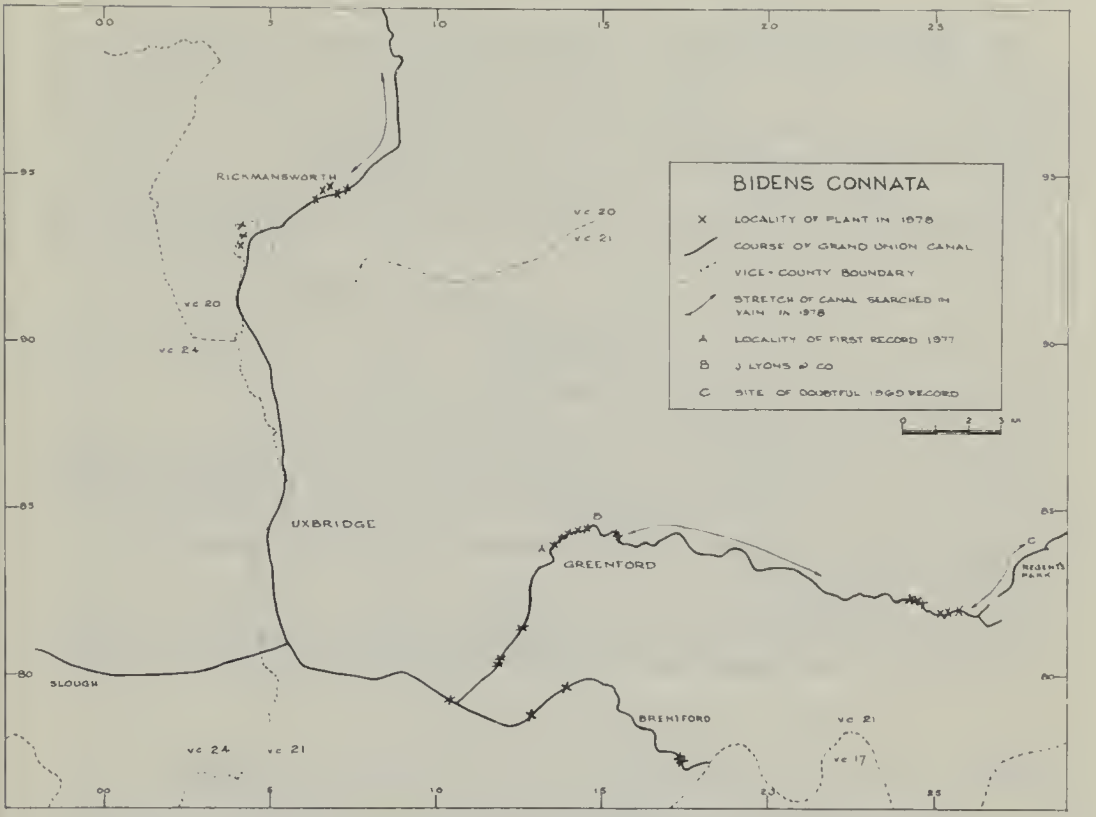

BIDENS CONNATA
X LOCALITY OF PLANT IN 1978
COURSE OF GRAND UNION CANAL
VICE-COUNTY BOUNDARY
STRETCH OF CANAL SEARCHED IN VAIN IN 1978
A LOCALITY OF FIRST RECORD 1977
B J LYONS & CO
C SITE OF DOUBTFUL 1969 RECORD
0 2 3 km
RICKMANSWORTH
UXBRIDGE
GREENFORD
SLOUGH
BRENTFORD
REGENT'S PARK
vc 20
vc 21
vc 24
vc 17
A
B
C
00
5
10
15
20
25
95
90
85
80

FIG. 2. Map of records of *Bidens connata* in relation to the course of the Grand Union Canal.

and strongly ciliate outer bracts, and var. *anomala* Farwell for plants with antrorse bristles on the margins and awns of the achenes, etc., when the supposed varietal characteristics can occur in assorted combinations. Plants with all these characters clearly belong in the one species *B. connata,* distinguished by its achenes (Fig. 1) with almost straight margins, strong median ribs, and surface with large roundish raised areas.

As the plant has been with us for some years it can no longer be determined how it was introduced. By far the largest and densest population discovered is also the most southerly, just above the locks at Brentford which connect the canal with the River Thames. If this is the point at which *Bidens connata* entered the system, it may be inferred that it was introduced with goods shipped to the adjacent warehouses. Another possibility is presented by J. Lyons & Co.'s depot at Greenford. Though this no longer receives goods by water, lorries are unloaded there close to the water's edge. Tea from the Americas arrives in large chests wrapped in hessian, to which *Bidens* 'seeds' could readily adhere. Tea from the Far East is transhipped at Rotterdam.

Having reached the canal system, alien *Bidens* species appear to depend on the movement of the water created by boat traffic for dispersal along it. Many of the waterside plants of *B. connata* occur near locks, bridge piers and other obstructions to flow. The species appear to favour urban and industrial areas, perhaps because of their higher air temperatures. It germinates later than the native species and needs to keep going well into the autumn in order to fruit. For this reason it may be expected to appear in the industrial Midlands, already noted as having *B. frondosa,* but perhaps not in other parts of Britain.

Two other American species in Sect. *Bidens* are said to have occurred accidentally in Britain, *B. laevis* (L.) Britton, Sterns & Poggenb.and *B. ferulifolia* (Jacq.) DC. These are listed by Druce (1928) under their synonyms *B. chrysanthemoides* Michx and *B. procera* D.Don. I do not know the circumstances of their occurrence and there have been no recent records.

My thanks are due to G. M. Easy for the drawing (Fig. 1) and to my wife for the map (Fig. 2).

REFERENCES

BURTON, R. M. 1978. Bidens connata. *BSBI News* **18** : 15 – 16.

CADBURY, D. A., HAWKES, J. G. & READETT, R. C. 1971. *A Computer-mapped Flora. A Study of the Flora of Warwickshire.* Academic Press, London, New York.

CANDOLLE, A. P. de 1836. *Prodromus systematis naturalis regni vegetabilis* . . . **5.** Treuttel & Würtz, Paris.

CORILLION, R. 1966. Une adventice nouvelle pour le Nord-Ouest de la France: *Bidens vulgata* Greene (Composées). *Bull. Soc. scient. Bretagne* **40** : 141 – 143.

DRUCE, G. C. 1928. *British Plant List.* Ed. 2. Buncle, Arbroath.

EDEES, E. S. 1972. *Flora of Staffordshire.* David & Charles, Newton Abbot.

ELLIS, G. 1978. Field notes: plants. *Nature Wales* **16** : 54 – 68.

HESS, H. E., LANDOLT, E. & HIRZEL, R. 1972. *Flora der Schweiz* . . . **3.** Birkhäuser, Basel & Stuttgart.

JERMYN, S. T. 1975. ("1974") *Flora of Essex.* Essex Naturalist's Trust Ltd., Colchester.

KROCKER, A. J. 1790. *Flora Silesiaca renovata* . . . **2.** Kornii, Bratislava.

LOUSLEY, J. E. 1961. A census list of wool aliens found in Britain 1946 – 1960. *Proc. bot. Soc. Br. Isl.* 4 : 221 – 247.

LOUSLEY, J. E. 1965. Botanical records for 1964. *Lond. Nat.* **44** : 12 – 27.

LOUSLEY, J. E. 1976. *Flora of Surrey.* David & Charles, Newton Abbot.

SCHUMACHER, A. 1941. Die fremden *Bidens*-Arten in Mitteleuropa. *Beih. Report. Spec. nov. Regni veg.* **131** : 42 – 93.

WALLACE, E. C., 1964. Plant records. *Proc. bot. Soc. Br. Isl.* **5** : 234 – 240.

YOUNG, D. P. 1957. *Bidens vulgata* Greene. *Proc. bot. Soc. Br. Isl.* **2** : 240.

The Ground Arthropods of London Gardens

by B. N. K. Davis*

During 1977 a survey of arthropods occurring in London gardens was made to study the effects of urbanisation upon insect diversity. This paper describes the 15 study sites and gives details of the species taken. The relationship of species diversity to habitat factors has been given elsewhere (Davis 1978). Animals which live on the surface of the ground were chosen for study because they are less mobile than flying insects, and therefore more dependent on local habitat factors. Pitfall traps provide a ready means of collection, and the use of a little ethylene glycol to kill and preserve the catches makes it possible to leave the jars in position for a month with little attention. Private gardens, rather than parks or areas of waste ground, were chosen because they occur throughout London and can be associated with different periods of development; traps are less vulnerable to disturbance or damage here than elsewhere. All sites (Table 1) fall within the boundary of the London Natural History Society's recording area, and sites 9, 10, 12 and 15 are within the old County of London. Eight traps were used at each site for the period 17/18 May to 14/15 June 1977 with a plastic petri-dish held over each to keep out rain, leaves and twigs. The south-east corner of the Chelsea Physic Garden was used for one central London site, the traps being placed about 10 m apart as was done in the other gardens as far as possible, to avoid bias due to differences in size.

Table 1 summarises the variety of habitat components recorded in each garden which might influence the presence or local abundance of different species. Features missing at any one site could have occurred in neighbouring gardens in many cases, but not at Chelsea or St Pancras where the gardens were isolated from any others by roads and buildings. The most ubiquitous features were grass lawns – unmown during the sampling period only at the Putney and Highgate sites – flower beds, areas of shrubs or hedge and small compost heaps. Garden trees ranged from a single plane at St Pancras to ten or more mature native and introduced species at Totteridge and Chelsea, whilst small areas of deciduous woodland lay adjacent to the gardens at Watford, Harrow and Friern Barnet. The traps were sited in areas of bare ground, usually around the perimeter of the gardens in or behind shrubberies and herbaceous borders.

Table 2 lists the 33 Coleoptera (beetles), 5 Chilopoda (centipedes), 8 Diplopoda (millipedes), 7 Oniscoidea (woodlice), 59 Araneae (spiders), 2 Opiliones (harvestmen) and 2 Pseudoscorpionidea (pseudoscorpions) identified from the samples. The species are given in taxonomic order. Staphylinidae and small numbers of other beetles, ants and earwigs have not been identified. An indication of relative abundance *in the traps* is shown by using a five point logarithmic scale. The actual numbers are of little significance as they depend so much on the time, method and intensity of sampling. The sampling time was selected on the basis of past experience to produce the optimum return in diversity of species for most groups within a four week period (Davis & Jones 1978), but it will inevitably have missed or under-recorded those which mainly appear earlier or later in the season. Largely subterranean species like geophilomorph centipedes, and jumping species like salticid spiders, will also be poorly represented in pitfall trap samples, whereas the method favours groups like ground-beetles (Carabidae) and woodlice which are very active on the soil surface.

---

*Institute of Terrestrial Ecology, Monks' Wood Experimental Station, Abbots Ripton, Huntingdon.

Table 1. Habitat features present in 15 London garden sites.

	Locality	Lawn	Flower bed	Shrubbery	Hedge	Cultivated ground (vegetables)	Deciduous trees	Conifers	Compost heap	Wild area (brambles etc.)	Rockery	Pond	Wall	Paling fence	Shed	Adjacent woodland
1	Lower Road, Denham	+	+			+	+			+		+		+		
2	Stuart Close, Hillingdon	+	+	+				+	+		+	+				
3	Langley Way, Watford	+	+	+		+	+		+					+	+	+
4	Marsworth Avenue, Pinner	+					+		+	+				+	+	
5	Church Hill, Harrow	+	+	++			+		+				+			++
6	Lodge Avenue, Elstree	++	+			++	+		+					+		
7	Wilmington Avenue, Chiswick	+	+	+	+	+			+					+	+	
8	Dollis Hill Lane, NW2	+	+						+	+	+			+		
9	Galveston Road, Putney	+			+				+		+		+	+		
10	Pembroke Square, Kensington	(+)	+	(+)								+	+			
11	Totteridge Lane, N20	++	+	+		+	+	+	+				(+)			
12	Chelsea Physic Garden	+	++	++			+	+	+			+	+			
13	Bishopswood Road, Highgate	+			+	+	+	+	+	+			(+)			
14	Hollickwood Avenue, Friern Barnet	+	+	+	+	+					+	+		+	+	+
15	Tavistock Place, St Pancras	+		+			+		+				+		+	

TABLE 2. Species collected in pitfall traps from the 15 garden sites between 17/18 May and 14/15 June 1977.

A = 1–5 individuals, B = 6–25, C = 26–125
D = 126–625, E more than 625.

	Site															Total indivi-duals	No. of sites
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
COLEOPTERA																	
Carabidae																	
Carabus violaceus L.		A			A		A									4	3
Leistus ferrugineus (L.)					B						A			A		8	3
L. fulvibarbis Dej.				A		A							A			3	3
L. rufomarginatus (Duft.)					A											1	1
Nebria brevicollis (F.)	B	B	B	B	D	C	B		A	A	B	B		A	C	391	13
Notiophilus biguttatus (F.)	A	A	A	A	A	A			A			B	B	A	A	53	11
N. palustris (Duft.)		A														1	1
N. rufipes (Curt.)	A	A	B	A	A		B	A	C	C	B	A	A	B	A	144	14
N. substriatus Wat.											A					1	1
Trechus quadristriatus (Schr.)	A												A			2	2
Asaphidion flavipes (L.)	B				B	A	C		B	B		B	B		A	132	9
Bembidion lampros (Hbst.)			A			A	B							A		13	4
B. nitidulum (Marsh.)						A	A									2	2
B. tetracolum Say		A														2	1
B. quadrimaculatum (L.)				A												1	1
B. obtusum Ser.						A										1	1
Stomis pumicatus (Pz.)						A										1	1
Pterostichus madidus (F.)	B	B		C	B	B	A				B		B	A		135	9
Abax parallelepipedus (Pill. & Mitt.)		B			A	A					A					13	4
Calathus piceus (Marsh.)					B											9	1
Platyderus ruficollis (Marsh.)					A		A			A						3	3
Agonum dorsale (Pont.)				A												2	1
Amara aenea (Deg.)									A							4	1
A. familiaris (Duft.)														A		1	1
A. plebeja (Gyll.)		A				A										2	2
Harpalus rufipes (Deg.)	A															1	1
H. rufibarbis (F.)														A		1	1
H. affinis (Schr.)	A									A					A	14	3
Bradycellus harpalinus (Ser.)					A											1	1

	Site															Total individuals	No. of sites
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Badister bipustulatus (F.)			A	A		A							A			5	4
Microlestes maurus (Stm.)	A															4	1
Metabletus foveatus (Fourc.)	A		A				A									6	3
Curculionidae																	
Barypeithes pellucidus (Boh.)	D	C	C	C	D	B	C	B			D	C	C	C		1004	12
CHILOPODA																	
Cryptops anomalans Newport			A													1	1
C. parisi Brölemann		A														1	1
Lithobius forficatus (L.)	A	A	A	A	A	A	A	A		A	A	A	A		A	33	13
L. melanops Newport									A							1	1
L. microps Meinert	A	A	B	A	A	A	A	B		A		A	A	A	A	54	13
DIPLOPODA																	
Brachydesmus superus Latzel											A					1	1
Polydesmus angustus Latzel			A	A	B						A					17	4
P. gallicus Latzel	B	A		B		A										18	4
Choneiulus palmatus (Nemec)															C	86	1
Ophyiulus pilosus (Newport)	B				A	B					A		A			20	5
Cylindroiulus teutonicus (Poc.)	B						A		A	C		B				92	5
Brachyiulus pusillis (Leach)						B										11	1
Tachypodoiulus niger (Leach)					A											2	1
ONISCOIDEA																	
Philoscia muscorum (Scop.)	A	C	C	D	C	B	C	D			C		C	D		1131	11
Oniscus asellus L.	A	B	B	C	B	B	B	B	B	C	B	A	C	B	C	257	15
Trachelipus rathkei (Brandt)		B		C		B								A		53	4
Metoponorthus pruinosus (Brandt)	B	A				B	B			A	C	A		B		73	8
Porcellio scaber Lat.	C	B	C	C	C	A	C	C	D	D	B	A	B	D	E	1683	15
Armadillidium vulgare (Lat.)	D	C		B		B	A				C			B		318	7
Androniscus dentiger (Ver.)	A															1	1
ARANEAE																	
Amaurobius ferox (Walck.)			A													1	1
Dysdera erythrina (Walck.)	A															1	1

	Site															Total indivi-duals	No. of sites
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
D. crocata C.L.K.								A	A							3	2
Harpactea hombergi (Scop.)			A				A		A							6	3
Segestria senoculata (L.)		A														1	1
Drassodes lapidosus (Walck.)								A	A							6	2
Drassodes sp. (imm.)								A	B	A						11	3
Micaria pulicaria (Sund.)		A						A			A			A	A	11	5
Clubiona corticalis (Walck.)			A					A						A		3	3
C. terrestris Westr.	A	A	A							A						5	4
C. compta C.L.K.		A	A		A	A										7	4
Phrurolithus festivus (C.L.K.)	A	A	A	A			A	A			A					19	7
Xysticus cristatus (Cl.)	A							A						A		4	3
Oxyptila praticola Walck.							A									5	1
Philodromus dispar Walck.											A					1	1
P. aureolus (Cl.)												A				1	1
Immature salticids								A								1	1
Pardosa palustris (L.)	A															1	1
P. pullata (Cl.)		A	A					D	A			A	A			143	6
P. prativaga (L. Koch)	B					A			A			A		A		15	5
P. amentata (Cl.)	C	B	B	D		A	A	B	C				C	B		433	10
Alopecosa pulverulenta (Cl.)								A	A							3	2
Trochosa ruricola (Deg.)			A													1	1
T. terricola Thor.		A														2	1
Immature lycosids	B	B	A	A	A	A		A			A		A	B		46	10
Pisaura mirabilis (Cl.)					A			A								3	2
Tegenaria gigantea Chamb. & Iv.		A		A	A	A		B	A		A		A	A		22	9
T. domestica (Cl.)			A													2	1
Tegenaria sp. (imm.)	A	A		A	A			A	B	A	A		A	B	A	43	11
Hahnia nava (Bl.)								C								30	1
Enoplognatha thoracica (Hahn)										A						1	1
Pachygnatha degeeri Sund.					A									A		2	2
Walckenaera acuminata Bl.			A		A									A		6	3
W. antica (Wid.)						A		B	A							10	3
W. cucullata (C.L.K.)			A											A		4	2
W. cuspidata Bl.				A												1	1
Gongylidium rufipes (Sund.)				A				A					A	A		10	4

	Site															Total indivi-duals	No. of sites
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Maso sundevalli (Westr.)			A								A					6	2
Pocadicnemis pumila Bl.			A	A				A								3	3
Oedothorax fuscus Bl.				A				A								3	2
Silometopus reussi (Thor.)		A					A									2	2
Tiso vagans (Bl.)				A	C		A				A		A	A		31	6
Aulacocyba subitanea (O.P.-C.)	A						A									2	2
Monocephalus fuscipes (Bl.)			A		B						B		A	A		22	5
Micrargus herbigradus (Bl.)			A	A											A	3	3
Erigonella hiemalis (Bl.)	A															1	1
Diplocephalus cristatus (Bl.)	A	A				B	A	A			A	A			A	31	7
D. latifrons (O.P.-C.)				A	B	A	A				A		B			41	6
D. picinus (Bl.)	A	B	C	B	C	C	C	C		B	C	C	C	C		636	13
Panamomops sulcifrons (Wid.)					A	A								A		5	3
Milleriana inerrans (O.P.-C.)					A											2	1
Erigone dentipalpis (Wid.)	A	A			A	A	A					A			A	9	7
Meioneta saxatilis (Bl.)													A			2	1
Microneta viaria (Bl.)			B		B			A			B	A	B			46	6
Centromerita concinna (Thor.)				A												1	1
Macrargus rufus (Wid.)					A											2	1
Diplostyla concolor (Wid.)	A	B	A	B	A	B	A	A			B	A	A	A		59	12
Lepthyphantes tenuis (Bl.)			A			B	A			A					B	23	5
L. zimmermannni Btk.					A											1	1
L. flavipes (Bl.)			A	A	B		A				B	A	A	A		37	8
L. pallidus (O.P.-C.)		A														1	1
Linyphia hortensis Sund.					A											1	1
L. (*Neriene*) *clathrata* Sund.				A	A											4	2
Immature linyphiids	A			A	A	A		A			B		B	A	A	33	9
OPILIONES																	
Oligolophus spinosus (Bosc.)		B	B	B		A	B	D	D	D	A		B	A		511	11
Platybunus triangularis (Hbst.)		A	A		C						C			B		122	5
PSEUDOSCORPIONIDEA																	
Chthonius tetrachelatus (Preys.)											A					1	1
Pselaphochernes scorpioides (Herm.)	A			A							C					53	3

Coleoptera

I have already discussed the Carabidae with reference to urbanisation, and have compared these results with other published records from urban areas (Davis 1978). Five species in Table 1 are not recorded by Allen (1951), Henderson (1945, 1946) or Richards (1964) from London gardens, namely *Leistus ferrugineus, L. rufomarginatus, Notiophilus palustris, Bembidion nitidulum* and *Stomis pumicatus,* but these were all uncommon species in this survey and were from the north-west quadrant of London, whilst their records were all from central or south London. No species occurred in all 15 gardens and only five occurred in half or more of the sites. The widespread occurrence of *Notiophilus rufipes* and *Asaphidion flavipes* in gardens has not previously been reported. Both are commonly associated with beech woodland around the London Area (P. M. Hammond pers. comm.).

The most numerous beetle obtained in the pitfall traps was the weevil *Barypeithes pellucidus.* This is said to be local and sometimes associated with tree nurseries (Joy 1932), so it was interesting to find it apparently well adapted to urban and suburban gardens. Allen (1952) considered that it was not rare between the end of March and June in his garden at Blackheath, where it was most often found under boards near fruit and other bushes. Several other weevils were present in small numbers, but were not identified.

Chilopoda and Diplopoda

All three species of *Lithobius* taken are common in gardens, and the only notable feature was the apparent replacement of *L. forficatus* and *L. microps* by *L. melanops* in the Putney site. *Cryptops anomalans* is a local species restricted to south-east England, whilst *C. parisi* is known only from a few widely scattered counties in England and Wales.

Amongst the millipedes, the population of *Choneiulus palmatus* in central London is remarkable, since this is an uncommon species. It is known to be synanthropic and has almost certainly been introduced, probably with soil on the roots of shrubs or other plants, but enquiries have failed to establish any recent link with other localities, and it may have survived here for some time. *Polydesmus angustus* and *Ophyiulus pilosus* are both very common and widespread species, whilst the commonest species in these samples, *Cylindroiulus teutonicus,* occurs mainly in south-eastern and some midland counties. *Polydesmus gallicus* occurs widely throughout southern England, but there are few records from vice-counties around north London.

Oniscoidea

Porcellio scaber and *Oniscus asellus* were the only woodlice taken in all 15 London gardens. Together with *Philoscia muscorum* and *Armadillidium vulgare,* they also ranked among the most numerous species of any group in the traps. On the other hand, pitfall trapping is clearly a very poor technique for obtaining *Androniscus dentiger* and *Trichoniscus pusillus,* species which are quite common in gardens, but tend to remain under rubble or plant refuse where the humidity is high. *Metoponorthus pruinosus* and *Trachelipus rathkei* have not previously been widely recorded in the London Area, and these records affirm the synanthropic tendencies of these two woodlice (Harding 1976).

Araneae

The spiders of London have been dealt with by Savory & Le Gros (1957), with additions by Bristowe (1964) and Russell-Smith (1976), and new county records by Locket, Millidge & Merrett (1974) and Merrett (1975). Again, the sampling method used and the habitats studied in this instance produce a rather different picture of the fauna. *Diplocephalus picinus*, the most common and widespread species in my samples, has hitherto only been reported from Hampstead Heath within the old County of London. This and other Linyphiidae, including *Gongylidium rufipes* and *Lepthyphantes flavipes* not recorded by earlier collectors in London, are probably associated with shrubberies and borders, whilst *Amaurobius ferox* and *Segestria senoculata* are associated with crevices in walls, etc. *Pardosa* spp. frequent open ground and *Tegenaria* spp. occur in cellars and outhouses – an unusual assemblage brought about by the structurally varied nature of garden habitats. The only new record is that for *Erigonella hiemalis* at site 1 in Buckinghamshire, though *Panamomops sulcifrons* and *Milleriana inerrans* are both local species. The Watford, Dollis Hill and Harrow sites produced the most diverse spider faunas with 20 – 21 species, whilst the four innermost London sites (including the Chelsea Physic Garden) yielded only six to nine species, and the remainder between 12 and 15.

Opiliones and Pseudoscorpionidea

Only two species were collected in each of these groups. *Oligolophus spinosus* was considered a common garden species by Savory & Le Gros (1957), and *Platybunus triangularis* recorded as a common species in a garden at Holland Park by Bristowe (1949). Samples collected later in the summer or autumn could be expected to be much better for this group (Davis & Jones 1978). *Pselaphochernes scorpioides* is associated with leaf litter, vegetable refuse and rotting wood, and may be not uncommon in gardens though it would be more readily obtained by sieving.

Discussion

In my earlier analysis of habitat factors (Davis 1978), the proportion of land occupied by gardens, parks, etc. within 1 km radius of a site was found to be the best predictor of faunal diversity (excluding the spiders, not then identified). This was interpreted in terms of the increasing opportunity which such open space afforded for different species to sustain populations within the urban environment. The inclusion of spiders actally improves the ability of this open space measurement to predict total species numbers at a site – the correlation coefficient is increased from 62% to 73%. There is also a clear relationship between species numbers and distance from the city centre (St Paul's Cathedral). Figure 1 shows that this follows a curved path with a rapid initial increase in faunal richness as one moves away from the centre, and a more gradual increase in the outer suburbs. The assumption of a logarithmic relationship provides a 74% fit to the observed data. The combination of both these variables gives the (significantly) best prediction model:

$$\text{Total no. of spp.} = 14.61 \times \log \text{distance} + 0.1868 \times \%\ \text{open space} + 0.64$$

$$(\text{Correlation coefficient } R^2 = 0.82)$$

Neither factor, of course, explains the presence or absence of any particular species at a site, and it is unrealistic to imagine that a synoptic explanation could apply to such a diverse collection of arthropods. Distance from the city centre may in fact be an indirect measurement of climatic effects, including the legacy of pollution by smoke and particulate matter. Chandler (1965) has summarized the climatic variations and divided Greater London into four zones. Zone 1 covers central London and sites 10, 12 and 15. Here the climate is characterized by higher temperatures than elsewhere, especially at night in summer and autumn, lower relative humidities and, in the past at least, intense concentrations of pollution and drastically reduced winter sunshine. Zone 2 occupies the inner suburban ring from Kingston to Willesden, Tottenham, East Ham, Lewisham and Mitcham and takes in sites 7, 8 and 9. This is intermediate between the central zone and the outer suburbs zone where pollution levels are comparatively low and

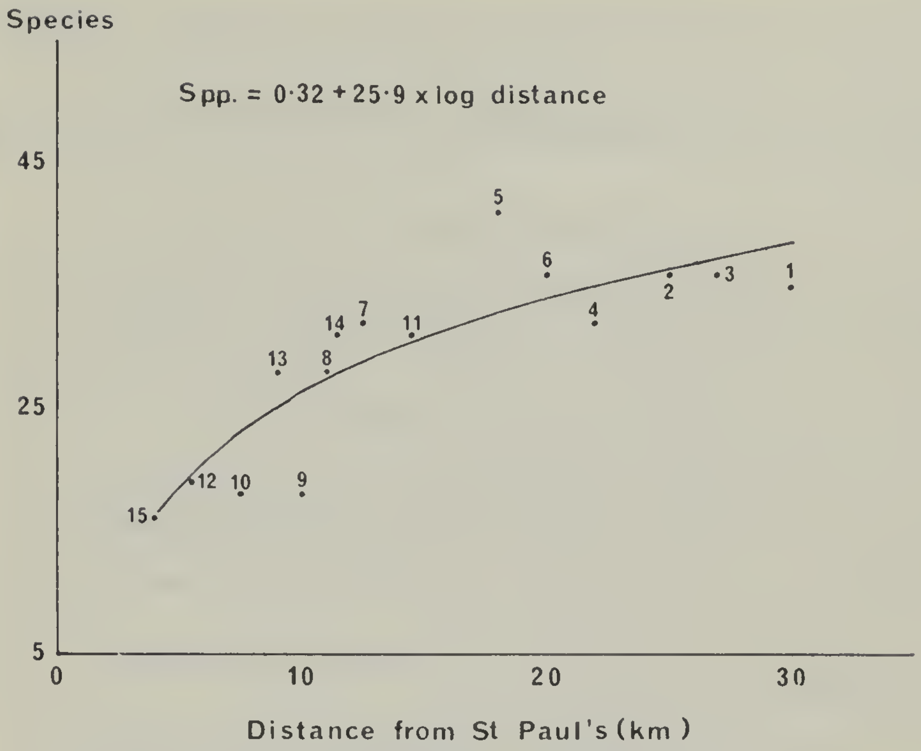


FIG. 1. Relationship between total arthropod species, identified from 15 London gardens, and distance from the city centre.

where it is still noticeably warmer than in the Green Belt i.e. 111°C higher when daily temperature differences are accumulated over a year. Sites 2, 4 and 6 would fall within this outer suburbs zone, leaving sites 1 and 3 at Denham and Watford just outside the urban area as defined by Chandler. Harrow Hill, site 5, would probably have much in common with sites 11, 13 and 14 which come into a north London heights zone, differing from the rest of London by being raised above the layer of town-modified atmosphere. Precipitation is higher here than over most of Greater London, pollution is relatively light, and temperatures differ little from those outside London. Autecological studies on individual species and competitive interactions are necessary to investigate the importance of these various factors.

It is a pleasure to reiterate my thanks to everyone who helped me with this study, particularly Mrs J. Cumming, Mrs G. Dain, Mr & Mrs P. King, Mr & Mrs T. J. Marshall, Mr G. Myers, Mr A. P. Paterson, Mrs M. Rey, Mr G. H. Roberts, Mr & Mrs K. G. V. Smith, Mr & Mrs A Sturdy, Mr G. Treasure, Mr R. A. Wallace, Mr M. R. Weaver, Mrs S. White and Mr J. S. Wickramaratna for the use of their gardens, Mr R. M. Hamilton, Mr A. M. Hutson and Miss S. West for help in locating them and Mr P. E. Jones and Mr H. Outhuis for their assistance with the trapping and indentification of material.

REFERENCES

ALLEN, A. A. 1951. The Coleoptera of a suburban garden. 1 – Adephaga. *Entomologist's Rec. J. Var.* 63 : 61 – 64.

ALLEN, A. A. 1952. The Coleoptera of a suburban garden. 4 – Rhynchophora. *Entomologist's Rec. J. Var.* 64 : 61 – 63.

BRISTOWE, W. S. 1949. The distribution of harvestmen (Phalangida) in Great Britain and Ireland, with notes on their names, enemies and food. *J. anim. Ecol.* **18** : 100 – 114.

BRISTOWE, W. S. 1964. Araneae (Spiders). *In* McCLINTOCK, D. (Editor) Natural history of the garden of Buckingham Palace. *Proc. S. Lond. ent. nat. Hist. Soc.* **1963** (2) : 48 – 50.

CHANDLER, T. J. 1965. *The Climate of London.* Hutchinson, London.

DAVIS, B. N. K. 1978. Urbanisation and the diversity of insects. *In* MOUND, L. A. & WALOFF, N. (Editors) *Diversity of Insect Faunas.* Pp 126 – 138. Blackwell, Oxford. [Symp. R. ent. Soc. Lond. **9**.]

DAVIS, B. N. K. & JONES, P. E. 1978. The ground arthropods of some chalk and limestone quarries in England. *J. Biogeogr.* **5** : 159 – 171.

HARDING, P. T. (Editor) 1976. *Provisional Atlas of the Crustacea of the British Isles. Part I. Isopoda : Oniscoidea.* Institute of Terrestrial Ecology, Abbots Ripton.

HENDERSON, J. L. 1945. The beetles of a suburban London garden in Surrey. *Entomologist's mon. Mag.* **81** : 38.

HENDERSON, J. L. 1946. More beetles of a suburban London garden in Surrey. *Entomologist's mon. Mag.* **82** : 38.

JOY, N. H. 1932. *A Practical Handbook of British Beetles.* Witherby, London.

LOCKET, G. H., MILLIDGE, A. F. & MERRETT, P. 1974. *British Spiders* **3**. Ray Society, London.

MERRETT, P. 1975. New county records of British spiders. *Bull. Br. arachnol. Soc.* **3** : 140 – 141.

RICHARDS, O. W. 1964. Coleoptera (Beetles). *In* McCLINTOCK, D. (Editor) Natural history of the garden of Buckingham Palace. *Proc. S. Lond. ent. nat. Hist. Soc.* **1963** (2) : 87 – 92.

RUSSELL-SMITH, A. 1976. Spiders from Hampstead Heath, London. *Newsl. Br. arachnol. Soc.* **16** : 5 – 6. [Reprinted in *Lond. Nat.* **57** : 55 – 56 (1978).]

SAVORY, T. H. & LE GROS, A. E. 1957. The Arachnida of London. *Lond. Nat.* **36** : 41 – 50.

PLATE 1. A female common wall lizard from the Middlesex colony. Photograph: D. Stiles

The Common Wall Lizard *Podarcis muralis* in Middlesex

by D. STILES*

For the past 21 years a colony of the common wall lizard *Podarcis muralis* (Laurenti) has existed on two railway bridges near Hampton in south Middlesex. The date of introduction is unknown, although the lizards were well established when I first observed them during the summer of 1957. Two specimens were sent for identification to the Zoological Society of London who confirmed the species.

Arnold & Burton (1978) state that the common wall lizard is widely distributed in Europe including the Channel Islands, although it also occurs in isolated colonies in southern England only by introduction. As far as I know this colony is the only one recorded for the London Area.

According to Smith (1973) only one large scale attempt to establish the common wall lizard has been made, when 200 specimens were liberated at Paignton on the south coast of Devon in 1937. For a few years some were seen in the neighbourhood, after which they disappeared, and it is not known if they bred. Two colonies are known to have been established in Surrey, although the introduction of the wall lizard into the south of England has generally proved unsuccessful.

Smith states that lizards in particular do not normally wander far from their home site, but when put down in country that is strange to them disperse in all directions. Having lost the landmarks which they are accustomed to use, they have nothing by which to guide them in their movements.

The lizards are very similar to forms occurring in north-west Italy, from where the species is imported into Britain in the spring. These forms are usually assigned to the subspecies *brueggemanni* (Bedriaga) and *nigriventris* Bonaparte. From my own observations the general colouration of the male lizard is green heavily marked with black. The female (Plate 1) shows a lighter green or yellow with fewer markings. Both sexes are whitish underneath, spotted with black except on the outer edges of their bodies where there is a row of blue scales. The young are yellowish-brown, changing colour upon reaching maturity. The adults frequently measure 18 cm in total length and the largest specimen (male) I have captured measured 20.3 cm (head and body 6.4 cm, tail 13.9 cm). The young, when first seen in August average 6 cm in total length. These figures include only specimens with undamaged tails, for the common wall lizard, like many European species, has the ability to shed its tail in times of danger as a means of escape. This process is known as autotomy.

The female common wall lizard is oviparous and lays usually four eggs in May depending on the weather conditions and the time of mating. During the breeding season there is frequent rivalry among the males for possession of the females.

The name wall lizard is very appropriate because they are very agile and are often seen scaling the walls during the summer months, and have even been sighted on footpaths, embankments and in neighbouring gardens. The lizards, however, usually live and hibernate in the cracks and crevices of the walls, although these retreats are not shared, and I have seen them fighting for possession. Their diet consists mainly of spiders, flies and grasshoppers.

*109 Oldfield Road, Hampton, Middlesex.

During the winter of 1973 renovation work was carried out on one of the bridges, and as a result many of the holes were filled in; presumably a large number of the lizards perished. However, despite the renovation work and frequent clearance of the embankments, the common wall lizard continues to survive in this locality.

References

ARNOLD, E. N. & BURTON, J. A. 1978. *A Field Guide to the Reptiles and Amphibians of Britain and Europe.* Collins, London.

SMITH, M. 1973. *The British Amphibians and Reptiles.* Collins, London.

Book Reviews

Spotter's Guides to Birds, Butterflies, Fishes, Garden Flowers, Rocks & Minerals, The Seashore, Trees, Wild Flowers. Various authors. 64 pp each. Usborne Pocketbooks, Usborne Publishing Ltd., London. 1978. £1.50 (hard cover), £0.65 (paperback).

These eight little books are children's guides of a very high standard. They are written and illustrated by specialists and the scope of the series is to help the spotter to identify a good many of the species that he or she will encounter in Britain and Europe.

The overall arrangement of the series starts with a concise introduction to each group, details of where to look, what apparatus to take into the field, and the relevant morphological features employed in identification. The contents are arranged, for instance, either systematically as in the bird volume, by colour as in the wild flowers, by habitats as in the fishes, or under the individual groups of plants and animals as in the seashore volume. The books have variously sections on collecting (rocks, minerals, shells and flowers), rearing (butterflies), feeding and surveying (garden birds), cultivation and recording (trees and wild and garden flowers), and some contain quizzes. The volumes end with a scorecard, a list of further reading, and, where appropriate, details of clubs to join. Each book is packed with excellent illustrations, most in colour, and the caption-type text is clear and concise. Latin names of the species are generally omitted, except for some of the sponges, but *Garden Flowers* and *Trees* each has a complete list of names to facilitate finding the species in other books.

K. H. Hyatt

The Water and Temperature Relations of Woodlice. By J. L. Cloudsley-Thompson. (Patterns of Progress, Zoology Series, No. 8). 84 pp, 19 text figs. Meadowfield Press Ltd., Shildon, Co. Durham. 1977. £2.80.

Those members who knew Professor John Cloudsley-Thompson as Chairman of our Entomology Section will already be well aware of his output as an author of scientific papers and text-books. Among his best works are *Spiders, Scorpions, Centipedes and Mites* (1958; Ed. 2 1968) and *The Zoology of Tropical Africa* (1969). However, since his appointment in 1972 as Professor of Zoology at Birkbeck College, University of London, John Cloudsley-Thompson has, with several other authors, contributed to a number of works which present reviews of important topics in which progress is currently being made.

The volume under review is far from being just a statistical survey of water and temperature relations; it is a readable biological account of the activities of woodlice, and contributes much to the understanding of this interesting group of crustaceans. The text is peppered with references, and the bibliography runs to over six pages.

K. H. Hyatt

The Status of the Hedgehog *Erinaceus europaeus* in the London Boroughs of Barking, Newham, Redbridge and Waltham Forest

by C. W. PLANT*

Summary

The distribution of the hedgehog *Erinaceus europaeus* L. was investigated for the years 1971 to 1977 in the north-east London Boroughs of Barking, Newham, Redbridge and Waltham Forest. The animal was reported from 118 (64%) of the 184 monads in the study area, and breeding was reported from 53 monads (29% of the study area, or 45% of the area from which the hedgehog was reported). Evidence is presented which suggests that the breeding season takes place about one month later than that in other areas of the country, but very much earlier than it does in Denmark. The factors affecting mortality were also investigated, and it was found that 77% of all reported deaths were caused by motor vehicles. Matters which require further study are pointed out.

Introduction

The hedgehog *Erinaceus europaeus* L. is described as being widespread throughout the British Isles, being common in most open country which has some cover for making nests and shelter, such as grassy heaths, cultivated land, open wood and scrub and sand dunes; abundant in gardens and parks in built-up areas but rare in woodland, marshes and high moorland (Southern 1964). It is a good swimmer and climber, not only of trees, but also of drainpipes and rough walls, especially where clad in creepers such as ivy (Burton 1968).

Its distribution in the London Area is fairly widespread and in 1975 an increase was noted in all areas apart from Essex (Gold 1976), whilst there was apparently no change in status during 1976, as nearly all records were from the usual localities (Hall 1978). There is however, little published work specifically on the status of the hedgehog in London, and as Gold had reported that Essex was the only area where an increase was not observed, it was felt desirable to study the distribution and status of this animal in north-east London.

Objects and Study Area

For the purpose of this study, a small geographical area was chosen as representative of the many habitat types available in the east London area. This would ideally include woodland and open countryside, along with parkland and areas of housing, and also an area of industrialisation as well as a part of the bank of the River Thames and the docks. Such an area is available within the operations of the Wren Conservation Group who sponsored this study, and comprises the four London Boroughs of Barking, Newham, Redbridge and Waltham Forest. Thus the study area lies in the Watsonian vice-county 18 (South Essex).

On the western side, the River Lee forms a convenient boundary and includes a part of the Lee Valley reservoir system. For convenience, the eastern limit was set at grid line TQ50, which excludes very little of Barking. Thus the area studied comprises 184 square kilometres (Fig. 1).

---

*Wren Conservation Group, c/o Passmore Edwards Museum, Romford Road, Stratford, London E15.

About 20% of the land in the study area is "open", in the form of parks, cemeteries, golf-courses, sewage treatment works, hospital grounds and Epping Forest. Epping Forest, here about one kilometre wide, penetrates from the north, whilst other wooded areas can be found at Wanstead Park and in the grounds of Claybury Hospital. The remaining 80% is largely housing, with some industrialisation mainly in the south and west. The majority of the houses are terraced, and usually open to side roads at one or both ends of the terrace. Most of the back gardens to the houses are consequently small, and the whole area is criss-crossed with busy roads (Fig. 1). The new M 11 motorway was opened in the autumn of 1977 and runs more or less parallel to Epping Forest three kilometres to the east. Of the 184 monads described in the area, only two are without human habitation: TQ3694 contains water only as a part of Girling Reservoir, whilst TQ4790 is arable farm land on Fairlop Plain. It is thus seen that there is a wide variety of habitats within the chosen area. Hedgehogs have regularly been seen at intervals throughout this area, and it was felt desirable that their distribution and level of population should be assessed, and to determine the effect of modern road traffic on their survival.

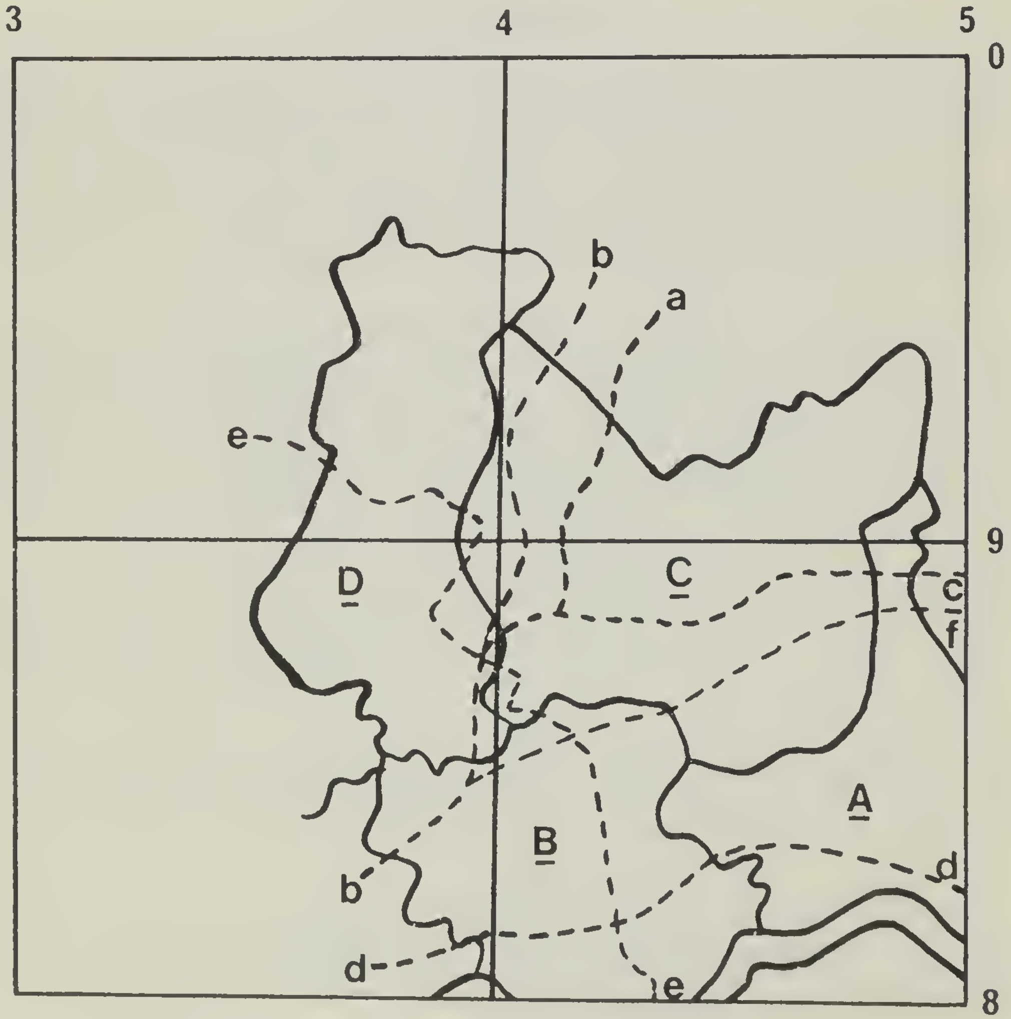


FIG. 1. The study area.

KEY: **A** Borough of Barking
B Borough of Newham
C Borough of Redbridge
D Borough of Waltham Forest

Major roads
a M 11
b A 11
e North Circular Road
c A 12
d A 13

Methods

The survey began in March 1976 and ran until the end of December 1977, and whilst the bulk of the records received related to these two years, many were received from the years before 1976. The present work therefore discusses the presence of hedgehogs in the study area from 1971 to 1977 inclusive.

As the species is one which few could fail to correctly identify, it was felt that the general public could be a valuable source of information. This would be beneficial in two ways: first it would enable a more thorough coverage of the area in a shorter time, and secondly the active involvement of the public in a wildlife survey can only create greater interest in wildlife itself. Appeals were therefore launched through the local and London newspapers, through the bulletins and newsletters of various natural history societies, and through the local radio stations. Mammal recorders of the relevant natural history societies were also approached for information. The minimum information requested consisted of the date of the observation and the number of animals involved, whether the animals were dead or alive, and if dead the cause should this be known. Locations were requested as an address where possible, to enable the sightings to be plotted on a map.

The information was collated on to record cards using one for each monad, and filed. Use of a London Street Finder and the present Ordnance Survey sheet 177 enabled exact locations to be plotted on a map of the area. This had the advantage that duplicate records could be easily recognised and eliminated after checking. As a result of involving the general public in the survey, I found it possible to visit the private gardens of several interested people to make further observations on "their" hedgehogs, and to suggest ways of improving their gardens to attract more wildlife.

Results

1. Distribution

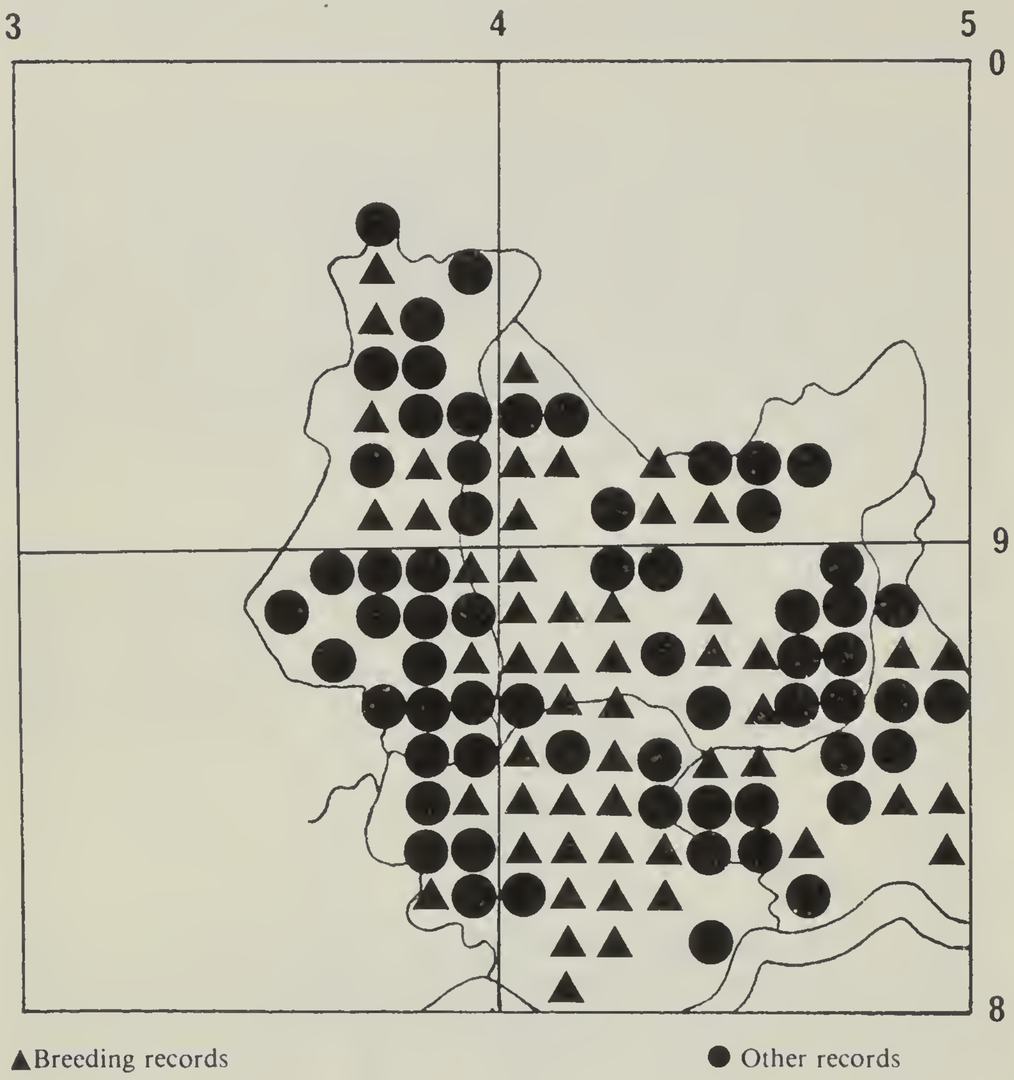
A total of 743 communications were received at the museum from members of the public and other people connected with the survey in response to our appeals, recording hedgehogs in 393 separate locations distributed over 118 (64%) of the 184 monads in the area. This distribution is displayed in Fig. 2. This involves a figure of at least 1,352 individual animals of all ages, although this value may be erroneously low, as when a record of a "family" was received and further inquiries could not reveal the true number of individuals, an arbitrary figure of three was applied. This would give a minimum population density of 7.35 hedgehogs per square kilometre in the study area.

TABLE 1. Analysis of hedgehog deaths in the study area, 1971 to 1977.

Cause	A	B	C	D	E	F	G	H
Number of deaths	484	3	7	3	1	40	3	92
% of total causes	76.50	0.47	1.10	0.47	0.16	6.32	0.47	14.51

KEY: A = road traffic casualties
B = domestic cat or dog
C = natural predation
D = deliberate human action
E = disease
F = drowning
G = fire
H = unknown cause, including those found dead in hibernaculum

FIG. 2. Distribution of hedgehog sightings in the London Boroughs of Barking, Newham, Redbridge and Waltham Forest, 1971 to 1977.



2. Mortality

Of the total minimum figure of 1,352 individuals, 633 were dead animals, and the causes of death where reported and verified are presented in Table 1. It can clearly be seen that the greatest single cause of death was the motor-car, and the distribution of these road casualties is shown in Fig. 3. It was noticed that the majority of the road-killed hedgehogs were young animals, and it was thought possible that this may represent inexperienced animals dispersing from the nesting area for the first time. Thus the spread of road casualties throughout the year is displayed as a histogram in Fig. 4.

Of the other causes of death, the three which died in fires were all found soon after 5 November (two in 1976 and one in 1977), and it is assumed that the animals were hibernating in the bonfire constructions. All the drownings occurred in garden ponds, except one which was found in a drain, and of the 25 ponds I examined, the level of water was so low and the sides so steep that it must be assumed that the animals could not escape the water after drinking or bathing.

All seven cases of natural predation involved urban foxes, whilst the deliberate human causes were two air-guns and one case of stone throwing. The remaining animal which died of disease was found in an advanced state of malnutrition and had the symptoms which one expects to find in a rabbit *Oryctolagus cuniculus* with myxomatosis.

A total of 46 freshly killed animals from the road were examined bacteriologically for pathogenic organisms in the gut, lungs and blood. In only one individual was any pathogen found: *Salmonella enteritidis* phage type 11 in the gut and blood of a young male from the Chingford area.

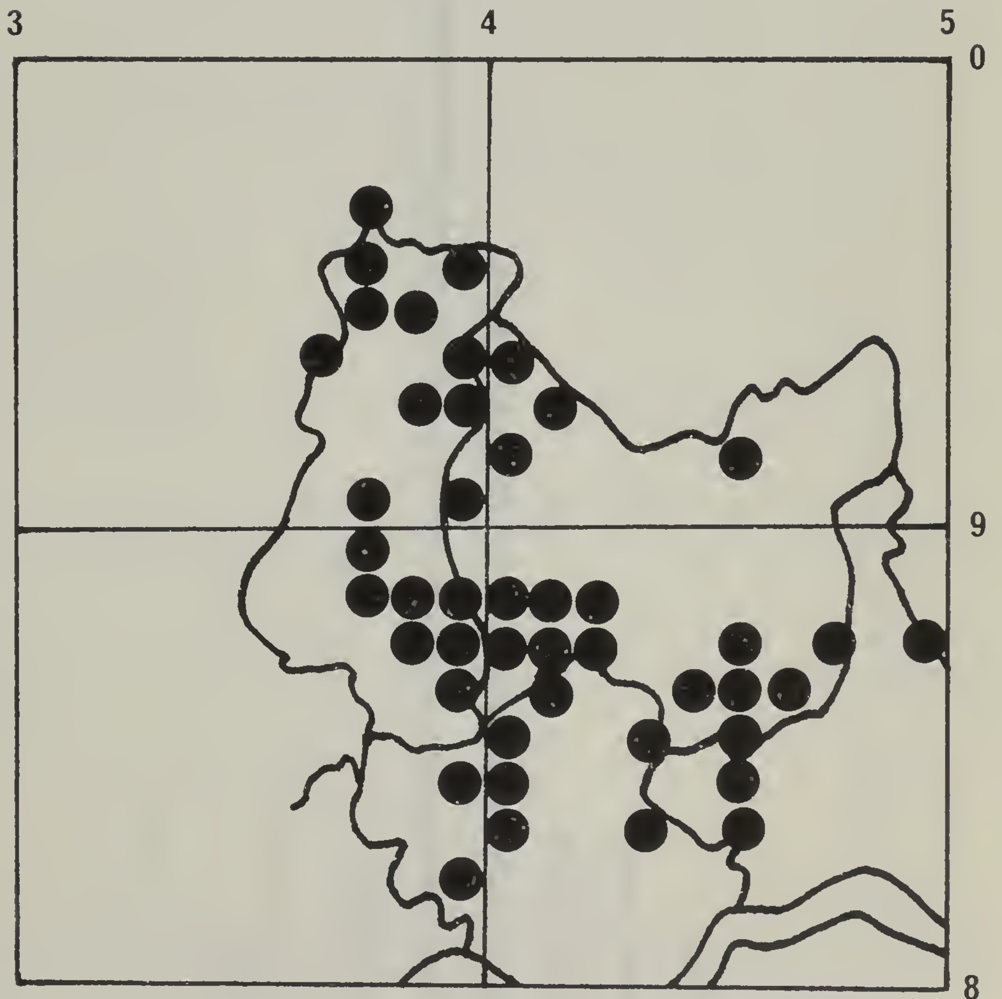
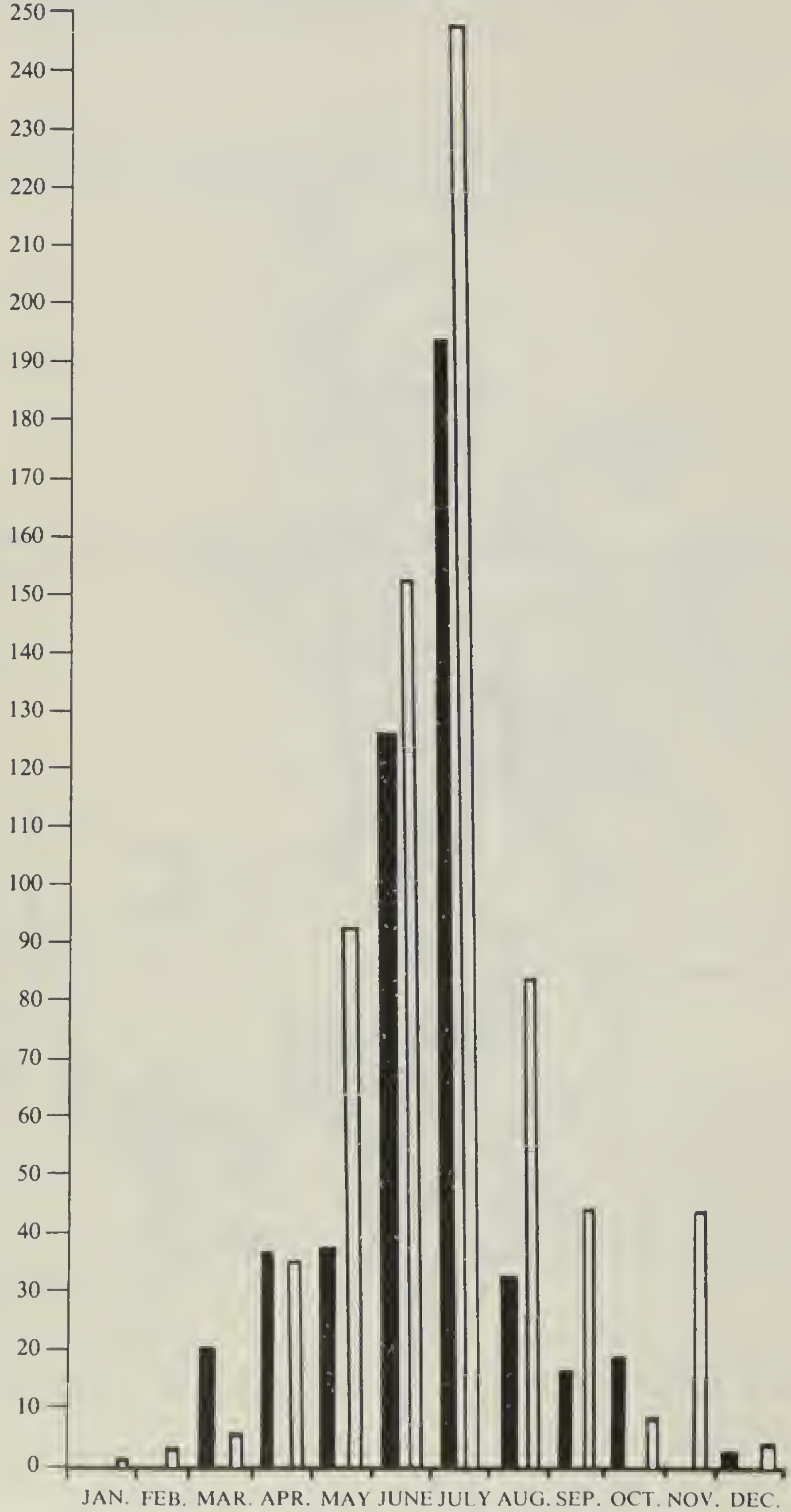


Fig. 3. Distribution of sightings of hedgehogs killed by motor vehicles in the London Boroughs of Barking, Newham, Redbridge and Waltham Forest, 1971 to 1977.

FIG. 4. Numbers of hedgehogs reported each month in the study area during 1971 – 1977. Solid bars = road casualties, open bars = live animals.



3. Breeding

The distribution of breeding records obtained in the study area is shown in Fig. 2. Positive proof of breeding was shown only in 53 monads (29% of the study area or 45% of the monads in which hedgehogs were recorded). A total of 19 nests containing dependant young were found. The dates of these observations are displayed in Table 2. Young adults out of the nest, but still in the company of the mother animal, were however seen throughout the year from 19 May to 20 October, and the frequency of these sightings is shown in Table 3.

The sites chosen by the adults for nesting were varied, ranging from natural hollows in the ground surrounded by vegetation, to a plastic washing-up bowl in the long grass of a railway embankment, where a brood of five was successfully raised. One interesting observation on maternal behaviour towards the young was supplied from a nest in a pile of "rubbish" in Little Ilford Lane. As the rubbish was being disposed of, the finder removed the entire nest and parent and placed it under his garden shed at home. Twenty-four hours later, the adult female was seen to lead two of the youngsters to the undergrowth of the garden several metres away, then return to a third youngster and later make a final trip for the fourth. Here they all stayed until the young were ready to become independent.

TABLE 2. Dates of nests in study area.

Date of Nest	Number of Nests	Number of young in nests
first week July	5	6.4.5.6.8.
second week July	4	5.4.5.3.
fourth week July	2	6.5.
fourth week Aug.	3	4.8.7.
first week Sept.	2	4.4.
third week Sept.	3	7.5.5.

TABLE 3. Frequency of sightings of young hedgehogs still in the company of the mother animal, but away from the nest site (1971 to 1977).

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Number of broods reported	0	0	0	0	6	23	28	7	23	10	0	0

4. Feeding

Many communications received contained references to the food eaten by hedgehogs in back gardens, and interesting though this may be, it appears that the species will eat just about anything that is put out for it (although one fussy individual refused to eat tomatoes, banana or butter beans out of a total selection of 14 choices provided by the thoughtful householder). No data have been gathered of any significance relative to the natural food of the hedgehog in the study area.

Discussion

1. Distribution and Status

The results obtained give a minimum population density of 7.35 hedgehogs per square kilometre over the whole of the study area. However, the animal was found only in 393 separate locations, and if we assume that each of these 393 sightings represent a "breeding unit", then over the 118 monads in which the animal was found, this would imply only 3.30 territories per square kilometre. This fits well with the results obtained by Herter (1965), who found that the territory of the nesting hedgehog may be only within 300 yards (274 metres) radius from the nest itself. His results thus allow for 4.23 nests per square kilometre.

Fig. 2 shows that the hedgehog is a widely distributed species throughout the area, with the exception of the Lee valley and Fairlop Plain, where the low numbers reported may be due either to lack of suitable breeding sites (e.g. due to the grubbing out of hedges on Fairlop Plain) or to observer bias, in as much as neither of these two areas is frequently visited; the docklands of Newham, where the environment is such that few if any hedgehogs could survive, there being very little vegetation in the concrete and asphalt; and the M 11 motorway where there has been much earth movement and construction work right up to the opening of the road in late 1977. Any hedgehog which did not vacate the area soon after construction work had started would not have survived the operations involved, and as yet it is too early to report on the recolonisation of the area by local animals.

Apparently roads are no obstacle to the survival of the hedgehog in spite of the high number of road casualties. It is possible that railway embankments may be used by the young adults in search of a territory for the first time. It seems likely that this spread will be largely of young animals, as the adults are thought to be not migratory and will use the same territory for nesting all of their lives (Herter 1965). This could help explain the high percentage of first year animals amongst the road casualties. If adults are indeed non-migratory and require a territory of some 274 metres radius, it is possible that one row of gardens enclosed front and rear by rows of terraced houses may serve as one breeding territory. As most terraces are open at one or both ends to a side road this would allow for the inexperienced youngsters in search of new territory to escape the terrace and cross the roads. This however would lead one to expect a higher nesting density than the 3.30 territories per square kilometre obtained, as there is room for one territory in every suitable row of terraced houses. Whether the majority of houses have unsuitable gardens making the terrace undesirable to a hedgehog, or whether the spread of the species is in fact being seriously affected by road deaths is a matter of conjecture, but it is most likely to be a combination of both factors. The animal does not appear to nest far away from human habitation, possibly due to the availability here of food scraps in and around dustbins. Thus, there are no known nests in say Wanstead Park, although there have often been seen hedgehogs scuttling to and fro between the park and neighbouring houses.

2. Observations on Breeding

Breeding was accepted as proven for a monad if one of three conditions was satisfied: copulation noted, nest of young found, or a group of obviously young animals noted still in the company of the mother. The average brood size is 5.32 young (see Table 2), which is higher than the figure of 4.6 obtained by Morris (1961). This slight increase may be a natural compensation for the high number of deaths on the roads, that is to say natality and mortality may well be directly proportional to one another. Further investigation is called for. In all the cases where copulation was watched it was not possible to discover the nests of any of the females, and thus gestation periods could not be obtained. Observations of young animals in their nests, however, gave a minimum period of total dependence on the adult female of 23 days, which compares favourably with the results of other workers (e.g. Herter 1965).

Whilst breeding may begin as early as the end of April and continue into September, with a continual emergence of weaned youngsters from May to October, there are two peak breeding periods. The first is in May/June with the appearance of weaned juveniles in June/July, and the second is in August/September with the appearance of the juveniles in September/October. Massey (1972) working on hedgehogs in the Scarborough district of Yorkshire associated peaks in the number of road killed animals in April/May and August/September, and a definite drop in June and July, with activity related to the two breeding periods of May to June and September. If the explanation for Fig. 4 in the results under discussion now is along the same lines as Massey's explanation, then it would appear that hedgehogs in east London do not commence breeding until about one month after those in Yorkshire. In the area around Arhus, Denmark (which at latitude 56 degrees north is on the same level as Edinburgh), the earliest litters are not born until July and the latest in September (Walhovd pers. comm.). This is another area of hedgehog biology which warrants further investigation.

The generally poor distribution of breeding records obtained, as shown in Fig. 2, is obviously not a complete picture. Breeding is only recorded in seven monads in the whole of the borough of Waltham Forest for instance, when in this borough hedgehogs have actually been sighted in 28 monads. This pattern is repeated in the other three boroughs covered, although Waltham Forest is worse in this respect. It seems inconceivable that hedgehogs should be present in such numbers as non-breeding animals, and the lack of records is probably due to the fact that to obtain proof of breeding is more difficult than to record merely a sighting.

3. Mortality

As discussed above, the greatest single cause of death is road accidents. Several observers reported that the number of deaths seems to increase when the failing light of day coincides with the evening rush of traffic out of London. In addition there appears to be several accident blackspots as far as the hedgehog is concerned, nearly all the deaths occurring on major routes for traffic, and very few on the minor roads in residential areas. Massey (1972) found that most deaths occurred on the bends of roads, with fewer on straight stretches where both parties could take evasive action. This does not apply in this study area, where the sheer volume of traffic can prevent a car driver from taking any evasive action at all.

Massey also discovered two peaks in occurrence of road casualties in April/May and August/September, as already discussed. These peaks were also obtained by Brockie (1960) and Davies (1957), and the latter author suggested that the peaks comprise largely inexperienced young animals venturing away from the nesting area for the first time. Whilst this opinion was shared neither by Brockie nor Massey, it does indeed seem to be the case in this study, as the majority of the road casualties were young animals. However, the two peaks obtained by these three workers are not forthcoming from the present results, where there is one massive peak in June and July (Fig. 4). If the peak breeding times are slightly later in this area than in Yorkshire, then there would be a correspondingly later dispersal of young animals, and a correspondingly later peak in road casualties. This would neatly account for the June/July peak, whilst the absence of the second peak may possibly be explained along the lines that if the second brood of young were born in September/October they would stand less chance of surviving to the weaning stage due to cooler weather conditions and a decreased food supply. Those that did survive to become independent in October would probably be more concerned with preparing for hibernation than with finding a new territory, and so consequently fewer animals may be available to cross roads and there would be less incentive to do so.

There is one small piece of evidence that supports this theory, although it is not proof. When digging a compost heap in November an observer found five hedgehogs hibernating together, and from their size he deduced that these were probably the mother and four of five babies he had seen regularly in his garden the previous month. If this theory is correct, then unless shared hibernation is the rule for late broods, the pre-weaning mortality rate must be greater than the value of 19.3% suggested by Morris (1977), at least for second broods in the study area. This theory may also explain the small peak of road killed animals in March, as these would be the inexperienced youngsters dispersing from the nest site for the first time after emerging from hibernation.

Conclusions

It seems obvious from the results obtained that the hedgehog is alive and well in east London, and managing to retain its position in the area. However, it does not seem to be increasing in number as rapidly as it could do, and may in fact simply be maintaining a stable population. This could be due to many factors, not least of which may be the non-availability of sufficient breeding sites and the high mortality rate obtained from road accidents. The species seems to prefer to live in close association with humans, and suggested reasons for this synanthropy are given by Howes (1976). If indeed the hedgehog is not increasing in status in any big way, whilst preferring to live in association with humans, it may prove a useful indicator animal in monitoring the changes in suburban gardens, which are fast becoming the nature reserves of the future, as our countryside is increasingly submerged beneath bricks and mortar.

I wish first of all to thank the various newspapers who carried the appeals for information: Ilford Recorder, Newham Recorder, Stratford and Newham Express, Redbridge and Waltham Forest Guardian Newspapers, Barking Advertiser, Evening News, Evening Standard and the Daily Mirror. Secondly, I wish to thank the editors of the bulletins and newsletters of various societies for the same courtesy: London Natural History Society, Essex Field Club, Essex Naturalists' Trust, British Naturalists' Association and Wren Conservation Group. Thanks are also due to Capital Radio, Radio London and LBC Radio who devoted air time to the survey. My gratitude is also expressed to Dr B. Chattopadhyay, Director of the Whipps Cross Public Health Laboratory for allowing the use of his facilities to make the bacteriological examinations on the dead hedgehogs, and to the Enteric Reference Laboratory at Colindale for phage typing the *Salmonella* isolated. Grateful thanks are expressed to Mr I. Robertson, Curator, and the long suffering staff of the Passmore Edwards Museum in Stratford for allowing the use of the museum's address for contributors to send records and telephone calls. Finally, I must thank all the members of the public, all the mammal recorders and anyone else who made contributions towards the survey, for without their help none of this would have been possible.

References

BROCKIE, R. 1960. Road mortality of the hedgehog *Erinaceus europaeus* L. in New Zealand. *Proc. zool. Soc. Lond.* **134** : 505 – 508.

BURTON, M. 1968. *Wild Animals of the British Isles.* Warne, London.

DAVIES, J. L. 1957. A hedgehog road mortality index. *Proc. zool. Soc. Lond.* **128** : 606 – 608.

GOLD, K. A. J. 1976. Mammals in the London Area 1975. *Lond. Nat.* **55** : 58 – 61.

HALL, D. G. 1978. Mammals in the London Area 1976. *Lond. Nat.* **57** : 92–95.

HERTER, K. 1965. *Hedgehogs: a Comprehensive Study.* Phoenix House, London.

HOWES, C. A. 1976. Notes on suburban hedgehogs. *Naturalist, Hull,* **101** : 147–148.

MASSEY, C. I. 1972. A study of hedgehog road mortality in the Scarborough district. *Naturalist, Hull,* **97** : 103–105.

MORRIS, P. 1961. Some observations on the breeding season of the hedgehog and the rearing and handling of the young. *Proc. zool. Soc. Lond.* **136** : 201–206.

MORRIS, P. 1977. Pre-weaning mortality in the hedgehog. *J. Zool., Lond.* **182** : 162–167.

SOUTHERN, H. N. (Editor) 1964. *The Handbook of British Mammals.* Blackwell, Oxford.

Book Review

The Handbook of British Mammals. Editors G. B. Corbet and H. N. Southern. 552 pp, 184 figs, including drawings, distribution maps and photographs. Edition 2. Blackwell Scientific Publications, Oxford. 1977. £9.75.

Nearly half the first edition of *The Handbook of British Mammals* (1964) was devoted to the biology of British mammals, and the remainder to the description of each species. The object was to stimulate interest and research in field study as well as to aid identification. The success of these aims was so great that not only was a complete revision required, but much more space was needed for the new knowledge. Many of the species accounts are now contributed by authors who have made them their special study. To make room and keep down the cost, a smaller size of print has been used, and the section on biology has been reduced to a single chapter.

The handbook covers Britain, Ireland, the Channel Islands and adjacent seas, and includes well-established introductions, as well as brief mentions of occasional vagrants, and species which have become extinct in historic times. Since 1964 three species of bat have been added to the list. Bank-voles have been found in south-west Ireland, probably introduced by man. American mink have occupied most of the river systems despite intensive trapping. Wild cats are now present south of the Scottish Highlands. Polecats have spread to most of Wales and beyond. Deer are spreading, especially sika and muntjac. There are small feral colonies of Australian wallabies in the Peak District and in Sussex.

As far as possible each species is dealt with under the following headings: description, measurements, signs, distribution (including very clear maps), variation, habitat, behaviour, food, breeding, population, predators and mortality, parasites and disease, relations with man, literature. There are 50 pages of references.

This edition has lost some of the fine appearance of its predecessor which was well bound and had good clear printing and pleasing drawings. In the second edition the drawings are often reduced in size and clarity, and the illustrations of the cetaceans are rather disappointing. Nevertheless, the new handbook is still very attractive, with its fine cover illustration and many helpful photographs. Page numbers for each species are given in the checklist for easy reference. There is also a more detailed index which, curiously, does not include rabbit or *Oryctolagus*.

For many years to come this excellent and comprehensive handbook will be an essential work of reference, not only for the scientific biologist, but also for all amateur naturalists seriously interested in British mammals.

GEOFFREY BEVEN

Survey of Bookham Common:

THIRTY-SEVENTH YEAR

Progress Report for 1978

General (G. Beven*)

The sudden death of Derrick Hall on 2 May 1978 was a great loss to the survey, in which he had taken an interest over many years. An expert entomologist, he was writing a series of papers on Coleoptera to complete the record for the common. It was also a great blow when, because of ill-health, Dr A. M. Easton announced his retirement as Chairman of the National Trust Bookham Commons Committee. We are most grateful for the kind co-operation and help we have had from this committee under his chairmanship since the very beginnings of the survey, and his influence on affairs will be greatly missed. In the early years Dr Easton did a great deal of entomological work, publishing many papers on Coleoptera in the *London Naturalist*. We very much hope to see him continuing his activities on the common. Nigel Davies, the Keeper, is leaving us in early 1979 to take up another post with the National Trust. We wish him well, but his going is yet another serious loss to the survey, as he has worked closely with this Society and has been very helpful, especially in discussions on conservation management and the preservation of wildlife, while constantly trying to improve the commons as productive habitats for nature. As a keen resident naturalist he kept a valuable record of events, and we are delighted that he hopes to continue his interests on the common.

Parties of Friends of Bookham Common were conducted over the area by R. C. Stern and A. S. Thorley. On 15 April survey work was demonstrated by B. Arthure to members of the Quekett Microscopical Club, and on 25 October to students of an extra-mural London University course in field studies.

Conservation Management during 1978

Between January and March some 135 oaks were felled in the eastern part of Eastern Wood and in Mark Oak Wood (Sq. 62, 64, 65, 67) and 77 in Hill House Wood. They were mainly Turkey and common oaks, 30 – 60 cm in trunk diameter. The result was a thinning, not a clear-felling. Trees were left lying during the summer, and cleared with minimal disturbance in the autumn. A further 0.5 hectares of "coppicing" was carried out in Eastern Wood (ref. 615), making a total of 2 hectares (5 acres) coppiced from 1975 – 78. Scrub and vegetation was scraped from two shallow depressions on Western Plain near the west bank of Bookham Stream (ref. 452 and 455) in an attempt to create a small marsh.

---

* 16 Parkwood Avenue, Esher, Surrey KT10 8DG.

Vegetation (Bryan R. Radcliffe*)

Twenty-five years ago a botanical survey was carried out which culminated in Jones' paper on "The Flora of Bookham Common" (*Lond. Nat.* **33** : 25 – 47 (1954)). In 1976 it was decided that sufficient time had elapsed to render a resurvey of the area very desirable, and in 1977 field recording commenced, as nearly as possible on the same basis. The work is still in progress.

In a period of a quarter of a century, it is to be expected that many plants will appear and disappear in an area. It is not surprising therefore that the present population of what might be regarded as casuals or introductions differs almost totally from that recorded by Jones. A feature of much more value in the assessment of long-term change is the variation (if any) in the distribution of relatively common native species. An early finding of the current survey is that native woodland plants such as *Arum maculatum* and *Dryopteris dilatata,* formerly of somewhat limited occurrence, are now to be found in many more divisions of the common. On the other hand *Plantago lanceolata* and *Trifolium repens* (plants of open habitats) have shown an equally spectacular decline. These are just a few examples from long lists of gains and losses. More than 100 species show a highly significant pattern of increase or decrease, and a directional bias is very marked. Woodland plants are advancing in a south-westerly direction while plants of more open habitats are retreating before them. This supports the general statements that have been made in the years since 1954 to the effect that grassland is being lost due to the encroachment of woodland.

Noteworthy species seen in 1978 include southern marsh orchid *Dactylorrhiza praetermissa,* two handsome plants found by G. Beven on Central Plain; summer snowflake *Leucojum aestivum,* a casual found on Central Plain by K. Page; bristle clubrush *Isolepis setacea,* abundant locally on a path on Bayfield Plain found by K. Page (last recorded in 1951 in a gun-pit on Eastern Plain where now apparently lost); *Lagarosiphon major* in the newly restored South-eastern Pond. One strand of *Lagarosiphon* was seen in August, six by December; if its behaviour in this pond follows that in adjacent parts of Surrey, we can expect the pond to be full of it within a short time.

Bryophytes (R. C. Stern†)

The common has been examined more intensively than previously, mainly as a result of the efforts of Mr O. French, and there are many new locality records. These are not being published in full this year, but work is being started on a bryophyte flora of the common for publication within the next two or three years.

The following have been found new to the common and include records by Miss E. M. Hillman and Mr J. C. Gardiner. The habitats are as given in Miss Hillman's paper in *Lond. Nat.* **54** : 49 – 58 (1975), and nomenclature follows the *Census Catalogue of British Mosses* by E. F. Warburg (1963), and the *Census Catalogue of British Hepatics* by J. H. Paton (1965).

---

* 82 Tattenham Grove, Epsom Downs, Surrey KT18 5QS.

† 14 Cherry Avenue, Yapton, Arundel, West Sussex.

	Areas	Habitats	Remarks
Ditrichum cylindricum (Hedw.) Grout	D	6a	(JCG)
Barbula revoluta Brid.	O	3	(EMH)
Bryum flaccidum Brid.	O	7a	On elder
Orthotrichum affine Brid.	O	7a	On elder – first definite record
Leskea polycarpa Hedw.	O	7b	Bank's Stream
Acrocladium cordifolium (Hedw.) Rich. & Wall.	C	1b	
Eurhynchium riparioides (Hedw.) Rich.	O	1e	
Plagiothecium curvifolium Schlieph. ex Limpr.	ABK	8	
Metzgeria temperata Kuwah.	O	7a	
Chiloscyphus polyanthos (L.) Corda	M	1b	S.E. Pond
Scapania irrigua (Nees) Dum.	D	2a	(JCG)

In addition, *Fossombronia wondraczekii* (Corda) Dum. was found by Mr Gardiner in G, this being the first record since 1967.

Aquatic Invertebrates (B. F. Arthure*)

On 15 April 1978 a party from the Quekett Microscopical Club compared invertebrates in Lower Eastern Pond and the Isle of Wight Pond. Members remarked on the poverty of life in the latter pond, so an experiment was undertaken with the intention of investigating the difference in the status of various invertebrates found swimming about half-a-metre under the surface in both places. The absence of flowering plants in the Isle of Wight Pond would make a total comparison of invertebrates less meaningful, so invertebrates on plants and on the bottom were avoided. Attention was given to the diversity of species or species groups that the two places are capable of supporting in the selected stratum.

The method of collecting consisted of drawing a plankton net – a triangular net with 10 cm sides and a 25 ml bottle – about half-a-metre out from the dam in both ponds. The water samples were passed through filter-paper and everything which could be clearly seen at x 20 magnification, i.e. about ¼ mm, was recorded.

The results were as follows (number of individuals in each group at each place):

	Lower Eastern Pond	Isle of Wight Pond
Bivalve molluscs	29	20
Cladocera	144	2
Copepoda	34	17
Ostracoda	28	368
Isopoda	1	—
Amphipoda	1	—
Ephemeroptera (larvae)	24	2
Trichoptera (larvae)	—	1
Totals	261	410

This data was treated with the Shannon diversity index, viz:

$$H = -\Sigma \frac{ni}{N} \times (\log ni - \log N)$$

---

* 145 Walm Lane, London NW2.

where ni is the number of individuals in a particular group in one site and N is the total of individuals collected at that site. Values for the two places were found to be as follows: Isle of Wight, H = 0.37; Lower Eastern, H = 1.38.

The results clearly show the impoverishment of the Isle of Wight Pond as regards its ability to support a wide variety of species in the particular stratum of water selected. The Shannon index goes from 0 to 2.72 and values around 2.0 are indicative of a high degree of diversity; values less than 1.0 suggest impoverishment or dominance of some sort. The low degree of diversity and high concentration of one or few species is characteristic of polluted water. For instance, Bank's Stream which carries sewage effluent is full of the detritus-feeder *Asellus* and practically nothing else. The pollutants in the Isle of Wight Pond are the clay particles suspended in the water. The pond seems to be very favourable only to ostracods. Why this should be so is difficult to explain.

Fish (G. Beven)

During 1978 the Isle of Wight Pond was considered to be overstocked with fish which were mostly small, probably because of food shortage. The large number may be a factor in delaying the recovery of the floating vegetation (*Lond. Nat.* **57** : 62 (1978)). Consequently on 30 May some de-stocking was carried out by the Fisheries Inspector, Thames Water Metropolitan Pollution Control, Mr J. T. Percival, to whom we are grateful for allowing us to quote from his report (13 June 1978). The following fish were removed:

	Number	Size
Common carp *Cyprinus carpio* L.	100	20 – 40 cm
Crucian carp *Carassius carassius* (L.)	400	8 – 23 cm
Rudd *Scardinius erythrophthalmus* (L.)	450	8 – 15 cm
Roach *Rutilus rutilus* (L.)	25	15 – 25 cm
Perch *Perca fluviatilus* L.	25	8 – 20 cm
Bream *Abramus brama* (L.)	12	15 – 28 cm
Total:	1012	

On the whole the fish were in good general condition, but there were low level infections of gill and skin parasites on rudd and crucian carp, namely *Costia, Dactylogyrus, Trichodina* and *Chirodinella.* These are often found on fish which are overcrowded. The larger carp (common and crucian) and rudd were about 8 – 11 years old and had clearly been growing steadily but at a fairly slow rate. The smaller carp and rudd were about 4 – 6 years old and showed a very slow rate of growth, i.e. they were stunted. The larger roach, perch and bream were 5 – 7 years old and were of fair size for their age. The smaller perch and bream were 3 – 5 years old and were a little stunted. It would appear that the fish population has been far too high for some years, and the food supply inadequate.

Birds (G. Beven)

Population Studies in Oak-wood

The breeding season census was repeated in the 16·hectare sample of dense pedunculate oak-wood (Eastern Wood) in 1978. Interesting changes occurred in the population of wrens and robins. The figures refer to the numbers of territories during the years 1974, 1975, 1976, 1977 and 1978 respectively: wren 27, 30, 22, 23, 33; robin 38, 33, 33, 34, 40. Thus after a slight drop in numbers the wrens have increased to the highest level since a census was begun in 1948, with the average size of territory being reduced to 0.32 ha. E. A. Armstrong (*The Wren* 1955) considered that the minimum territory size in woodland was 0.6 – 0.8 ha. The 1977 – 78 winter was fairly cold, but in S. E. England there were no prolonged periods of continuous frost.

Population Studies in Scrub and Grassland

The breeding season census was repeated in 39 hectares of scrub and grassland in 1978 (G. B. and W. D. Melluish). Changes of population occurred in the following species, the figures being the numbers of territories for 1974, 1975, 1976, 1977 and 1978 respectively. Increases were recorded in magpie 6,5,5,5,9; wren 23,26,23,22,26; blackcap 5,5,4,4,8; garden warbler 5,3,8,6,12; whitethroat 13,7,16,8,9; lesser whitethroat 3,4,5,4,6; and starling 0,1,4,4,6. Decreases were recorded in great tit 16,14,18,12,10; blue tit 12,9,15,10,6; robin 25,26,32,34,30; willow warbler 21,24,37,28,24; and greenfinch 2,3,1,3,0. The nightingale population 2,2,6,3,3 remained static, and grasshopper warblers were not recorded for the second year in succession.

Status of Doves on Bookham Common

It may be of interest to consider the status and habitat preferences of the four breeding species of doves. The stock dove *Columba oenas* is a bird of savanna woodland or wood-edges. It was present in 1943 but "Much less frequent than the Wood Pigeon" (*Lond. Nat.* **23** : 29 (1944)) and also in 1954. Between 1957 and 1963 there was a sudden general decline in Britain, possibly due to toxic chemicals, and this dove then seemed to disappear from the common. There was subsequently a gradual general recovery, so that by 1972 birds were singing in the dense Bookham oak-woods, where they have remained scarce. In the 16 ha sample (Eastern Wood) from 1950 onwards there were no records until 1972 when there was one territory, in 1973 nil, 1974 nil, 1975 1, 1976 1, 1977 nil and 1978 1. A singing male was present in S. E. Wood in 1972, 1977 and 1978, and one in Central Wood in 1976.

On the other hand the woodpigeon *Columba palumbus* is satisfied with many types of woodland, and even tall scrub with scattered trees. It is very common, wintering flocks of up to several hundred feeding largely on the surrounding farmland, and only occasionally searching the woodland floor in hard weather, chiefly when acorns are abundant, presumably being discouraged by the denseness of the wood. In summer a few pairs nest in the oak-wood and open scrub and grassland. In the 16 ha oak-wood the number of breeding territories was: 1949 2, 1950 2, 1951 5, 1952 2, 1953 5, 1954 4, 1955 3, 1956 1, 1958 3, 1959 4, 1960 4, 1961 3, 1962 2, 1963 3, 1964 5, 1965 5, 1966 7, 1967 8, 1968 6, 1969 13, 1970 15, 1971 15, 1972 10, 1973 12, 1974 8, 1975 10, 1976 11, 1977 14, 1978 6. In 39 ha of scrub and grassland the numbers of territories were: 1964 1, 1965 2, 1966 4, 1967 1, 1968 1, 1969 6, 1970 3, 1971 5, 1972 7, 1973 7, 1974 6, 1975 3, 1976 8, 1977 9, 1978 10. The figures suggest an increase in recent years. Since 1949 the oak-wood has become more dense, and in the scrub areas the trees and shrubs have been growing larger.

The favoured habitat of the turtle dove *Streptopelia turtur* is scrub with scattered trees, and it occurs only sparsely in the dense oak-wood. On 39 ha of scrub and grassland the numbers of territories have increased in the last seven years, probably because the trees and shrubs have grown in size: 1964 5, 1965 4, 1966 3, 1967 5, 1968 3, 1969 7, 1970 4, 1971 8, 1972 12, 1973 11, 1974 10, 1975 8, 1976 13, 1977 11, 1978 10. But in Eastern Wood (16 ha) the numbers have been small, often none, rising to a maximum of five in 1971, then declining: 1949 0, 1950 0, 1951 0, 1952 1, 1953 1, 1954 0, 1955 0, 1956 2, 1958 2, 1959 0, 1960 0, 1961 0, 1962 0, 1963 2, 1964 2, 1965 2, 1966 1, 1967 1, 1968 1, 1969 1, 1970 4, 1971 5, 1972 1, 1973 1, 1974 1, 1975 0, 1976 1, 1977 0, 1978 0.

Collared doves *Streptopelia decaocta* nested in Britain for the first time in 1955. The first territory recorded on Bookham Common seems to have been in 1967 when there was one in 39 ha of scrub and grassland. Subsequent records of territories were 1968 0, 1969 0, 1970 0, 1971 0, 1972 0, 1973 0, 1974 1, 1975 0, 1976 1, 1977 1, 1978 1. On the common they occur chiefly on the outskirts near gardens and car parks, being closely associated with human habitations where grain is available.

Other Notes on the Birds

A pair of little grebes nested in Lower Eastern Pond and hatched four young in June. A pair of tufted ducks nested and brought six downy chicks on to the Hollow ponds. This appears to be the first record of them nesting on the common. Sparrowhawks hunted over Western and Bayfield Plains up to November, despite the finding of a female shot dead on 17 April (ref. 493). A water rail was seen on Lower Eastern Pond on 16 February (W.D.M.). At least one, possibly two, singing male Cetti's warblers *Cettia cetti* were present along Bookham Stream from 13 May until 5 July (Andrew Merritt and others). This is the first record for the common of this continental species, which seems to be spreading into dense thickets along streams in south-east England.

Mammals (G. Beven)

On 12 November, alerted by a shrill scream, W. G. Teagle and G. Beven observed that a stoat *Mustela erminea* had seized a rabbit *Oryctolagus cuniculus* by the back of the neck. The rabbit sat quite still. After a few moments two people using a high-pitched whistle to train dogs distracted the stoat, which released its hold and retreated. It then returned and again seized the rabbit by the nape, but the whistle once more disturbed the stoat, which finally let go and vanished into a thicket, leaving the rabbit sitting quite still until it fell over on to one side. Nevertheless, when we approached the rabbit roused itself and crawled into a dense thicket (ref. 453). During 1978 there were six records of weasel *Mustela nivalis,* while roe-deer *Capreolus capreolus* were recorded from eleven sites. A report on a rabbit survey has now been completed by Oliver French. Of the 136 grey squirrels *Sciurus carolinensis* shot on 8 March, all were in good condition. There were many pregnant does, but no young animals.

Book Review

The Mammals of the Palaearctic Region. A Taxonomic Review. G. B. Corbet. 314 pp, 104 distribution maps. British Museum (Natural History), London. 1978. £25.

As stated by the publishers, information on the Palaearctic mammals is so fragmentary and scattered that only once before has even a checklist been compiled. This book is much more than a checklist. There is a general discussion of each order and genus, followed by a useful identification key to each species, using mainly the external features and teeth. Scientific and vernacular names with synonyms are given and races discussed as appropriate. The range is covered by a map and brief note, and there are interesting remarks on the more variable species. Cetaceans are not included.

This is clearly an important standard work of high value and scholarship, intended perhaps mainly for the museum taxonomist. However, it is also of great interest to the conservationist.

Geoffrey Beven

A Study of *Ruscus aculeatus* on Bookham Common

by Ella M. Hillman*

Summary

The possible origins of the plant *Ruscus aculeatus* L. on Bookham Common are discussed. Observations over a five-year period confirm trends observed in the previous two years. The species can claim to be sub-dioecious at Bookham by virtue of one indisputable case of a berry on a "male" plant, the only exception to its dioecious character recorded in five years. Apparent cases of male and female shoots arising from the same rootstock are attributed to another cause.

The flowering period is in winter from October to May. The scarcity of fruit disproves effective self-fertilisation as the general rule, and the timing of fruit development shows that winter flowers are not fertilised. This observation and the fact, now better demonstrated than in the preliminary survey, that female plants fruit better in the vicinity of male plants, support the idea of cross-fertilisation by chance insect visitors in the spring.

The dispersal of fruit is a matter remaining unsolved, as is the propagation of the plant except where it is very close to established bushes.

Some effects of the 1976 drought are mentioned. Further notes on the ecology of *Ruscus* are added.

Introduction

1. This account of the survey of the Bookham Common population of butcher's broom *Ruscus aculeatus* is based on the field work of a partnership of three amateur observers, Audrey Warren, Joan Stoddart and myself. I would like to express my thanks and appreciation of the hard work that my partners have put into the amassing of facts over a period of seven years. The tentative conclusions from the first two years' work have already been published (Hillman & Warren 1973). I also thank Oliver French and Nigel Davies for assistance in the field work in recent months.

History

2.1 It is doubtful whether there exist any records which refer to the introduction of *Ruscus aculeatus* on Bookham Commons. There would be a great inducement for apothecaries from the Middle Ages to *c.*1800 to grow the plant as it was one of the great aperient roots, a famous diuretic and specific for the stone. It is suggested that a herbalist or simpler living near the common might deliberately have planted pieces in the woods, since the plant does not do well in open situations, but he would be unlikely to have dispersed them over the 112 ha (280 acres) which is the present area of woodland (Harvey in litt.). Some such origin seems probable since the concentration of its population in the Bookham woodlands appears to be much higher than in other woodlands in the London Area.

2.2 John Bray (d.1381) gives the names Bruscus fagrum vnobholei, bonewort or kneholm (Harvey in litt.). The name "kneeholly" seems to have arisen as follows. "VNOBHOLEI" stands for "VNOBHOLEIM", and V is a mis-transcription for K, so that the name was knob-holm or knobholly and it is asked (E. L. Hillman in litt.) whether the plant was a cure for "knobbes" such as Chaucer's summoner had. The name "bonewort" suggests that it may have been. This raises the question of plant signatures, for the berries are "knobs" on the cladodes.

---

*16 Exford Road, Grove Park, London SE12 9HD.

"Bruscus" or "Brusse" means a brush or broom, and this plant may also have been propagated by those who supplied butchers with brooms to sweep their blocks, and even by the "gipsies", mentioned in the previous account, for sale at Christmas time. We have observed nothing that could suggest human cultivation of *Ruscus* at Bookham today; unfortunately it is now a story of human predation.

Survey Objectives

3. The survey set out to discover the means whereby the population of *Ruscus aculeatus* on the common regenerates at the present time. The first two years taught us that under the conditions of the LNHS Bookham Common survey – a monthly visit – it would be impossible to record direct evidence of the necessary facts. It was thought worthwhile to obtain more precise data in the hope of confirming the tendencies noticed after the former two years' work. Some techniques were improved, so I do not include the numerical data from the first two years in this account, which refers only to the years 1973 – 77.

The questions to which we hoped to find answers were:

(i) Is the rate of unassisted vegetative spread enough to account for the wide distribution of the species on the common?

(ii) If not, new plants would arise from berries. How is this winter-flowering dioecious species fertilised?

(iii) How are seeds dispersed?

Methods

4. The number of marked bushes was increased from 55 to 105, a few of which were destroyed in forestry operations.

On each monthly visit a varying number of clumps was inspected, and the following data recorded for each:
for question (i) the number of new shoots, for (ii) the number of berries, and, in consideration of all the factors which could affect their abundance, the number of flowers, the distances of female from the nearest male bushes, and the sizes of the bushes, which were measured in the middle year of this five-year survey, for (iii) any sightings or evidence of the activity of birds or mammals.

The area of the common covered by this survey is about half the total woodland area, being bounded by a line a few paces into the woodland beyond that enclosed by Common Road, Hill House Path, High Point Path, Eastern Wood Path, Hollow Path, and Tunnel Path (south).

4.1 Size. In an attempt to answer question (ii), the effect of all the factors which might affect fruiting performance must be assessed. Size of clump is one of these, but however large the bush, if there is no pollination of its flowers there will be no fruit. We therefore made an estimate of the volume of space which would just contain the bush, ignoring exceptional stems, an approximation to an elliptical cylinder sufficed for most cases. This defines 'size'. The sizes ranged from 0.003 m^3 (i.e. 3 litres) to 5.7 m^3 and were classified as follows:- V.L. (very large, over 2.0 m^3, 17 bushes), L. (large, 17 bushes), M. (medium, 15 bushes), S. (small, 31 bushes), and V.S. (very small, under 0.04 m^3, 21 bushes). In all 101 clumps were measured, 65 ♀, 36 ♂, 4 late additions of male plants being excluded.

4.2 Flowers. Flowers were counted at each visit and, to enable this to be done in the limited time available, symbols were used to denote six classes shown under Table 1. In any given year, many records will be made when the bushes are not at the peak of their flowering production; this difficulty is overcome by making counts over five years, each bush in different months. It is important to realise that these counts, even if made in consecutive months on the same plant, give no clue to the plant's total output of flowers (unlike the counting of berries, which are scarce). We therefore had recourse to using its maximum count in the five-year period as a measure of its flowering performance relative to the other bushes. Only open flowers were counted.

4.3 Fruiting. At the end of the first two years of the survey it became apparent that merely recording a month-by-month count of berries was not satisfactory, as many were being included in several counts owing to their propensity for remaining on their cladodes for many months. By marking with coloured strands the shoots on which berries were found, in a sample of 30 marked berries only one exception was observed to the following, which we have therefore adopted as the general rule:

(i) A green berry is the same as a green one recorded earlier if both observations occur within the period April to September of the same year.

(ii) A red berry is the same as a red one recorded earlier if both observations occur between October of one year and May (– August) of the next.

(iii) A red berry is the same as one recorded when green if the red berry is observed not earlier than October of the year in which the green berry was recorded. See Fig. 1.

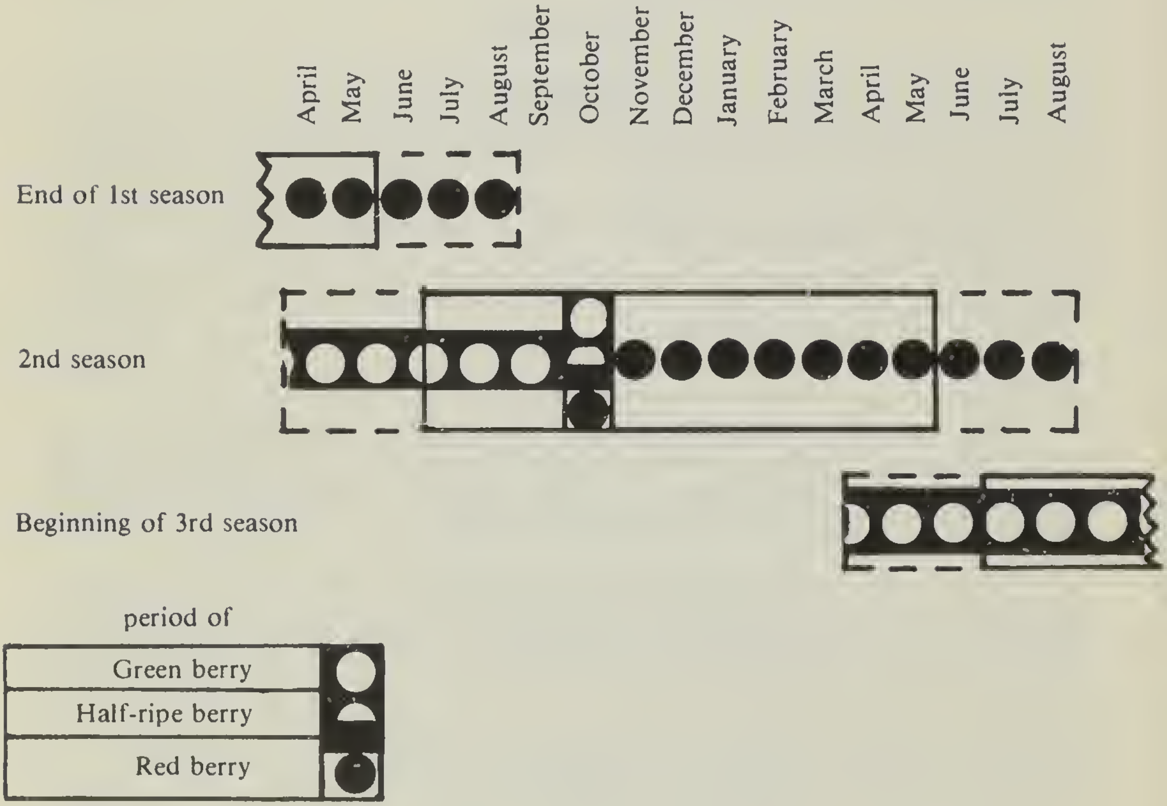


FIG. 1. A season's fruiting (2nd season) in relation to that of the preceding and the following season. The dotted lines indicate periods when very few berries are found. In October green, half-ripe and red berries are found. It will be noticed that, although it is sometimes more than a year before an individual berry falls, there is no overlap in the duration of green berries of one season with that of the next. The same applies to red berries (the only exception being a red berry found on a male shoot).

4.4 New shoots. These are soft, pale green and drooping at first, and are rather like shoots of *Asparagus,* which is the nearest relative in the British flora. They first appear in May and quickly grow to their maximum height, that of the plant to which they belong. By October the earlier shoots of the year cannot easily be distinguished from some of the older shoots, so we recorded only soft light green stems, and not those which had not protruded through the leaf litter as these would be recorded later.

Observations

5. Those observations which are used to link size, flowering and fruiting will be found in section 6 (Analysis).

5.1 Sex. The possibilities for this normally dioecious species were discussed in the former account (Hillman & Warren 1973). Our sample of marked clumps in the Bookham population is now composed of 39 males, 65 females and one andromonoecious on the strength of one berry on a very large male clone. All the flowers on the same shoot were male, both in the same year and the year after the berry appeared. A portion of a female clump torn up by a tractor appeared to become gynomonoecious when transplanted to a north London garden, producing its first berry without the presence of a male plant in the vicinity. The part of this plant remaining behind at Bookham has continued to bear no fruit.

Dr P. F. Yeo kindly sent me some flowers from his hermaphrodite clones. The shoot bearing the only flower which survived the journey through the heat of 1976 was placed in water and the flower's development observed. The time between the first appearance of pollen and the closing up of the perianth was half a day, and if the time on a growing plant is the same, it is small wonder that hermaphrodite flowers can easily be missed. No evidence of any but dioecious plants has been found other than the two instances mentioned above, although repeated searches have been made on those clones where self-pollination might be suspected (see 6.2).

At the beginning of the survey, as the flowers of each clump were all of one sex, it seemed reasonable to suppose that each clump formed a clone with all stems arising from the same rootstock. In time, however, we found several cases where both male and female shoots arose within the clump. This might seem to confirm the opinion (Scott & Stokoe 1944 : 296) that "stems bearing male flowers and others bearing female flowers can arise from the same rootstock". I have been unable to find corroboration of this statement and there is another possible explanation of this phenomenon. We have occasionally seen a berry drop from a female plant, and if the berry germinates where it falls, giving rise to a male plant, then both related sexes will grow together. The only way to decide the issue is to dig up the rootstock and inspect it, and although "no interference" has been the watch-word of the survey, at the end of seven years, with permission, we were assisted in digging up such a clump, and when their tangled roots were carefully separated the male and female proved to be different plants. The clump was then replanted.

5.2 Flowering. Counting flowers has enabled us to give, in Table 1, the flowering period for *Ruscus* on Bookham Common. It is much more extended than that for the British plant given in Clapham, Tutin & Warburg (1962), i.e. January – April; for the Bookham plants it is (September –) October – May (– June). A few flowers were found in two of the September counts and in one of the three June counts. The peak of the flowering season is from February to April.

TABLE 1. Month by month comparison of flowering performance.

The Table shows the number of bushes in each flowering category, all counts having been totalled for each month of the year during the 5-year period 1973 – 1977. In brackets is the number of years in which counts were made in that month. No flowers were observed in July (2 years) or August (4 years).

Flowering categories determined on each count are as follows: ∞: over 50, < 50: 21 – 50, < 20: 11 – 20, < 10: 6 – 10, < 5: 1 – 5, and none (not listed). The numbers of bushes in each category and their totals are expressed as percentages of the number visited, to provide a comparison of one month with another.

	Sept.		Oct.		Nov.		Dec.		Jan.		Feb.		Mar.		Apr.		May		June	
No. of	(3)		(5)		(4)		(4)		(3)		(4)		(3)		(4)		(4)		(3)	
flowers		%		%		%		%		%		%		%		%		%		%
∞	0	0	0	0	6	8	0	0	4	10	6	8	8	14	6	7	13	12	0	0
< 50	0	0	5	6	3	4	7	12	7	17	10	13	11	19	20	24	17	16	2	3
< 20	1	1	9	10	5	7	6	10	1	2	19	25	13	22	18	21	18	17	0	0
< 10	2	3	11	13	10	14	6	10	8	19	9	12	13	22	14	17	14	13	1	1
< 5	3	4	17	20	29	41	25	42	15	36	24	32	9	16	20	24	24	23	14	21
Total:																				
flowering	6	9%	42	48%	53	75%	44	73%	35	83%	68	91%	54	93%	78	93%	86	81%	17	25%
observed	67		87		71		60		42		75		58		84		106		67	

5.3 Fruiting. Survey objectives required a classification of bushes according to their fruit production. Five categories were set up as in Table 2. The first two are euphemistically named V.G. and G., for the amount of fruit is in no case large, the second class being only slightly better than average. The frequency of fruiting has been taken into account as much as the amount of fruit.

TABLE 2. Classification of bushes according to their fruit production.
All were examined in each of the five seasons of the survey except where stated, e.g. 1/2½ means that the plant was inspected for 2½ seasons and fruited in 1 season.

Category	*No. of seasons fruiting*	*Total No. of berries*	*No. of bushes*	*Total*
Very Good (V.G.)	4 – 5 2/2½	14 – 19 8	5 2	7
Good (G.)	3 – 5 4 or 3/3 or 1/3 1/2½	6 – 11 5 8	11 4 1	16
Average (Av.)	2 – 3	2 – 4	20	20
Poor	1 1	2 1	5 9	14
Nil	No fruit recorded in 5 seasons' observations.		8	8
			Total:	65

TABLE 3. Comparison of fruiting seasons.

	(1) No. of marked bushes o in sample	(2) No. of bushes visited	(3) No. of visits	(4) No. in fruit	(5) (4) as % of (2)	Berries					No observations in these months
						Green only	Green then red	Ripening	Red only	Total	
1973–4	57	52	110	29	56%	35	7	—	15	57	Jan., Mar.
1974–5	57	51	89	29	57%	5	6	2	38	51	——
1975–6	64	62	157	24	39%	2	5	—	33	40	July, Aug., Sept.
1976–7	66	64	127	25	39%	28	4	—	19	47	Nov., Dec.
1977–	65	65	83	32	49%	37	13	9	34	93	July

Comparison of fruiting seasons. "Number of berries recorded" is abbreviated to "No. of berries" throughout. The numbers must be regarded as minimal, but, as the berries are conspicuous and persistent, we believe that the figures are reasonably accurate.

In Table 3, the number of berries must be seen in relation to the number of bushes examined, which is near to the number of marked female clumps in each season. A season lasts from July of one year to May of the next, with extensions shown in Fig. 1, except for 1977 –, which ends on 31 December 1977 when the last of several extra autumn counts was made. "No. of visits" shows that on average each bush was examined twice in each season. The number in fruit is expressed as a % of the number visited. Where there are few green berries compared with red, it indicates that more counts were made later than earlier in the season.

5.4 Vegetative propagation. Other types of shoots (not counted) have been observed which have not been seen in the "*Asparagus*" form (4.4). These have appeared when a plant has suffered damage. They resemble a mature shoot but are very short, about 20 – 30 cm, and many frequently come up together, forming a dwarf clump. Occasionally also groups of fairly short stems, mature in appearance, are found *c.*60 – 100 cm apart, suggesting that they are springing from the same creeping rhizome, though in one case tested no connecting rhizome was found.

One of the fastest growing smaller clones is recorded thus:

Sept. 1973 2 clumps and several isolated stems.
Aug. 1976 clumps of 5,6,6,7 and 10 stems surrounding hazel.
Mar. 1977 clumps of 2,5,5,10 and 11 stems surrounding hazel.
Nov. 1977 clumps of 3,5,6,11 and 12 stems surrounding hazel + 5 new clumps of 'dwarf' type.

These last were probably due to disturbance of the colony in clearing operations.

At the other extreme two very small (V.S.) plants did not grow in height nor increase beyond a total of 6 shoots each between 1970 and 1976, and open flowers were not recorded until 1975 and 1977 respectively. These are the two immature females mentioned in 6.2.

The results for the normal new ("*Asparagus*") shoots are shown in Table 4. They have been expressed as the number per 10 bushes examined. In this way comparison of output of new shoots month by month and from year to year can be made. There were no counts in July – September 1975 and July 1977, but a comparison is possible between 1974 and 1976, the year of drought, when the June and July counts, per 10 bushes examined, were 17, 14 and 50, 119 respectively. These new shoots are often observed well within the clumps, even large ones, and have never been observed coming up at a distance of over 30 cm from a main clump.

TABLE 4. New Shoots

	No. of bushes examined	*No. of new shoots*	*No. per 10 bushes examined*
1974 – 75	*63*	*87*	*14*
1975 – 76	*34*	*89*	*26*
1976 – 77	*98*	*628*	*64*
1977	*71*	*235*	*33*

When the sexes are analysed separately there is no significant difference between them; both are taken together here.

5.5 Variation. A few departures from the norm have been noted. Cladode width is variable in all species of *Ruscus;* under "stout cladodes" are included only those which are about twice as long as the norm for Bookham as well as being wide and thick.

(i) Narrow cladodes: 1♂September 1973, 1♂October 1973, 1♀ March 1975, 1♂August 1977.
(ii) Stout cladodes: 1♀ January 1972, 1♀ October 1973, 1♀ June 1975, 1♂ June 1977, 1♂October 1977, 1♂January 1973, & December 1977.
(iii) Two flowers on each of three cladodes: 1♀ April 1976.
(iv) Two flowers on one cladode: same ♀ plant December 1977.
(v) Oval berry broader than long: same ♀ plant November 1977.
(vi) Small green berry later than June: 1 December 1973, 1 November 1977.
(vii) Berry on male shoot, and red in April 1976: persisted at least until May 1977.

5.6 Ecology (i) During 1977 an increase in browsing and grazing of *Ruscus* has been noticed. A low bushy growth is put out from bushes which are grazed to ground level. During a period of snow cover, in a cleared area of the woods, two bushes of medium height were devoured; they would have been the only greenery visible above the snow blanket. There were many rabbit droppings in the area. Plants of this height with their tops eaten away at other seasons had probably been browsed by roe-deer; they can deal with prickly plants and leave characteristic signs (Forestry Commission 1966). One devoured a green berry but left our coloured strand.

(ii) Human predation continues to take its toll. A very small (V.S.) bush, the most prolific with 11 stems bearing 8 berries, was reduced to 2 stems and 3 berries. It is an offence to mutilate plants on National Trust property.

(iii) One insect which is very noticeable in connection with *Ruscus* plants is the seven-spot ladybird *Coccinella septempunctata* which hibernates on the bushes, usually near the tip of a shoot. Falling oak leaves are caught on the prickles and afford shelter. These insects were so numerous in 1976 – 77 that it was rare to find a bush without one, but usually there was only one per bush.

(iv) There are often many spiders' webs together on one bush in the spring, although many other bushes are without any.

(v) In the darker parts of the wood, holly *Ilex aquifolium* is the chief competitor and it can split up a large clump of *Ruscus* and smother it. Where there is more light, bramble *Rubus* spp. and honeysuckle *Lonicera periclymenum* impede its development, and on the edge of the wood bracken *Pteridium aquilinum* causes rapid deterioration. Exposure to frost may be responsible for the poor condition of *Ruscus* plants in clearings.

Analysis

6.1 Vegetative propagation. (i) There was a much greater output of new shoots in 1976, a year of drought (Table 4). This can hardly be due to energy diverted from seed production inhibited by early shrivelling of flowers, as normally this is negligible. Perhaps this plant of Mediterranean origin found the unwanted heat favourable to its growth.

(ii) At the rate of spread described in 5.4, it does not appear possible for the population of *Ruscus* to have reached its present distribution by vegetative means alone. At the end of 500 years, the last plants would be at most 300 metres from the first at the observed rate of annual growth.

6.2 Fruiting performance. Four relationships were investigated by means of scatter diagrams. Size of clump was slightly correlated with flower production but many small bushes had abundant flowers. Flowering performance was not correlated with fruit production. Fig. 2 shows the relationship between size and fruiting. Fig. 3 shows the only clear case of correlation in the four, between fruiting performance and the distance of the female plant from the nearest male bush or bushes. It can be seen by comparison with Fig. 2 that this distance is more significant for fruiting than the size of the bush. Though five of the seven V.G. fruiters are also very large, two other very large bushes have borne only one berry between them in five seasons, and one V.G. fruiter is very small. Fig. 3 shows three non-fruiting plants which are as close to males as other plants which fruit well, but two of these remained immature (see 5.4) and the third was repeatedly mutilated.

This investigation has provided the confirmatory indirect evidence that, since the proximity of male plants has the dominant influence on fruit production, cross-pollination is the general rule for fertilisation of *Ruscus* at Bookham.

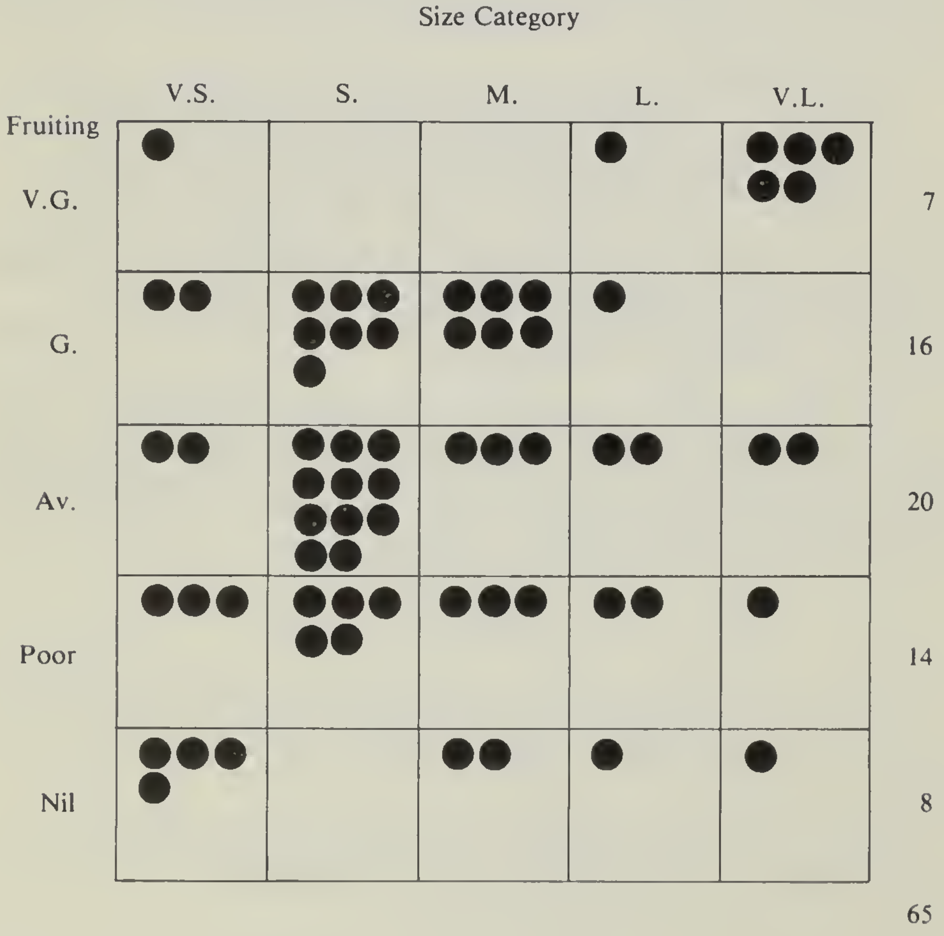


FIG. 2. Fruiting output related to size of bush for all 65 female bushes in the sample. See Table 2 for categories of fruiting, and 4.1 of text for size of bush.

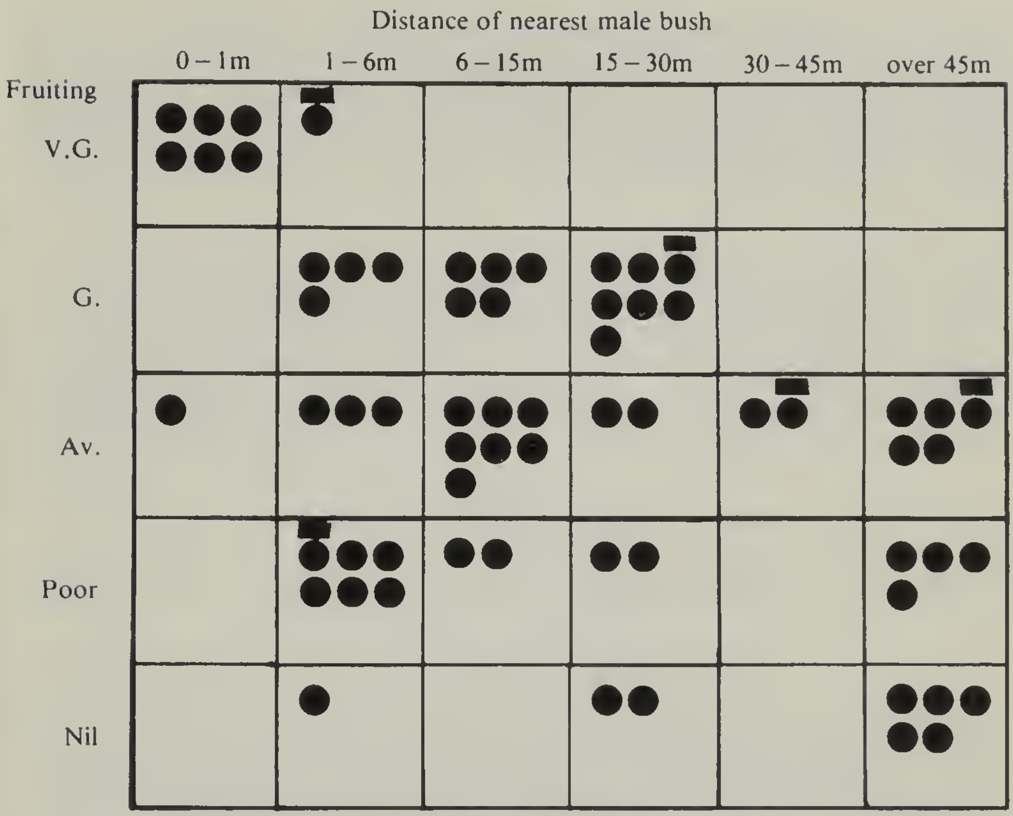


FIG. 3. Relationship between the amount of fruit on female bushes and the proximity of male plants. See Table 2 for categories of fruiting. The line over a dot indicates more than one male.

A number of winter-flowering plants are self-fertilised in the absence of insect pollinators (Bennett 1869), and it is significant that the winter flowers of *R. aculeatus* at Bookham do not produce any berries, a fact observed for another population by Reid (1892). The conclusion is that winter self-fertilisation involving the development of hermaphrodite flowers is exceedingly rare. If it were a usual method of fruit production, moreover, in all probability the quantity of fruit would be much greater and would show correlation with the abundance of flowers. The timing of fruiting further indicates cross-pollination in the spring; as wind would be equally effective in winter and as *R. aculeatus* does not resemble wind-pollinated plants in its structure, it seems that insect pollination, from March – May, must be the general rule.

We have never observed an insect visiting the flowers for pollen or nectar. *R. aculeatus* has a history of introductions from the Mediterranean region and has no regular insect pollinator associated with it in this country. Such pollination as occurs must be by chance contact with arthropods, etc., or by localised wind currents where male shoots are intermingled with the female plant.

As we have recorded one example of a berry on an otherwise male plant, we do not rule out the possibility of there being a minimal number of hermaphrodite self-fertilised flowers, but we have found none (see 5.1). On the contrary, a thorough search among those bushes of good and average fruiting which seem to be furthest from male plants, has in some instances revealed the unsuspected presence of a nearby male.

Two more observations support the idea of insect pollination. (i) One female close to a male but not fruiting was found to be an early flowerer, and may thus have missed the chance of insect pollination. (ii) When fruiting depends on insect pollination it is affected by the weather in the previous spring. Table 5 shows the Meteorological Office results for Kew for four of these years, in comparison with the number of berries.

TABLE 5. Comparison between weather conditions and fruiting of the bushes.

+ indicates above average, — below average; the greatest differences are given in full.

	Mean max. temp.			*Mean min. temp.*			*Hours of sunshine Mar.-May*	*No. of berries*	*No. of bushes examined*
	Mar.	*Apr.*	*May*	*Mar.*	*Apr.*	*May*			
1974	—	+	+	+	—	—	499	51	51
1975	—	—	—	+	+	+	390	40	62
1976	—	+	+2.1°C	—	—	+	563	47	64
1977	+	—	—	+1.6°C	—	—	501	93	65

It is to be noted that 1975 with the lowest count of berries had the least sunshine, the other years having at least 28% more during the spring flowering; the abundance of fruit in 1977 may be the result of the mild March weather in that year.

6.3 Seed dispersal and new plants. In this population *Ruscus* berries do not appear to be chosen by any animal or bird, in spite of their colour. Perhaps, like the pollinating agent, the agent for dispersal is absent from this country. The berries remain on the cladodes, uneaten often for many months. Our efforts to observe evidence of germination of fallen berries on marked spots have met with no success. Dr Yeo (in litt.) remarks on the very variable germination period in other species of *Ruscus*.

Isolated new plants, which are discovered infrequently, could be plants uncovered by clearance operations, or arising from the rootstocks of damaged plants. We have not yet found a young plant coming up at more than a metre from a female plant to justify a confident assertion that it arose from a berry.

Thus after seven years' observations we have no evidence to support the idea that the widespread and plentiful distribution of *R. aculeatus* on Bookham Common has been brought about by natural regeneration.

6.4 Sex. From 5.1 it is seen that the ratio of males to females in the sample of 105 bushes is 3:5, but there is some bias here because in the last two years of the survey we have added only newly found females in order to obtain as much information as possible on fruit. When adjustments are made to include other bushes observed within the area, the ratio is nearer 5:7. It is of some interest that female plants predominate in this wild population, as males are said to be more numerous in garden plants (Chittenden 1956). These probably arise when, instead of propagating the usual garden var. *hermaphroditus* vegetatively, horticulturists raise new plants from seed, as experiments by Dr P. F. Yeo suggest. When andromonoecious plants, which have some hermaphrodite flowers, were cross-fertilised, the male offspring were the most numerous of the three types.

6.5 Variation. The small variations in the Bookham population are more likely to be due to mixed ancestry than to mutant genes (Hutchinson 1955:854 and 2.1). Where shoots of different appearance are seen in the same clump, it is possible that they belong to more than one plant. Female plants often drop berries close to themselves and these may give rise to plants of different genetic make-up growing together.

I have already paid tribute to the field workers. In addition I am greatly indebted to Dr P. F. Yeo for much helpful information and advice and most interesting discussions. I also wish to thank Mr John Harvey, author of "Bookham Common: A Short History" (*Lond. Nat.* 1943), from whose letters I quote on the origins of the plant and its names, Mr E. L. Hillman for his comments, Dr G. Beven for the use of his reports from the Meteorological Office, and finally the Editor and botanical Sub-editor for their help with the manuscript.

REFERENCES

BENNETT, A. W. 1869. On the fertilisation of winter-flowering plants. *Nature, Lond.* **1** : 11.

BRAY, J. (d. 1381). *Sinonoma de Nominibus Herbarum.* (MS).

CHITTENDEN, F. J. 1956. *Ruscus.* In Chittenden, F. J. (Editor) *The Royal Horticultural Society. Dictionary of Gardening* **4** : 1840. Clarendon Press, Oxford.

CLAPHAM, A. R., TUTIN, T. G. & WARBURG, E. F. 1962. *Flora of the British Isles.* Ed. 2. Cambridge University Press, Cambridge.

FORESTRY COMMISSION. 1966. The roe deer. *Forestry Commission Leaflet* **45.** HMSO, London.

HILLMAN, E. M. & WARREN, A. 1973. Survey of *Ruscus aculeatus* on Bookham Common. *Lond. Nat.* **52** : 93 – 103.

HUTCHINSON, J. 1955. *British Wild Flowers.* **2.** Penguin, Harmondsworth.

REID, C. 1892. Correspondence. *Nat. Sci., Lond.* **1** : 160.

SCOTT, T. H. & STOKOE, W. J. 1944. *Wild Flowers of the Wayside and Woodland.* Warne, London.

A Further Contribution to the Coleoptera of Bookham Common

by D. G. HALL*

This second paper, like the first (Hall 1977), is once again a continuation of the series started by Dr A. M. Easton in 1946, the references to which are cited by Beven (1968). Several families of Coleoptera found on Bookham Common are dealt with below.

Many of the species are carrion feeders, and one of the main sources of records is that of Easton (1967), who studied the beetles attracted to a dead fox which was found near the railway tunnel on 12 November 1964. The corpse was removed to the north-east corner of the common and visited regularly. The other sources are from Coulson (1942), Jones (1978), and my own captures between 1949 and 1957, plus a few others.

The numbers in round brackets after the species records refer to the numbered references quoted first at the end of the paper. My own records are indicated by DGH, whilst captures made on field meetings of the British (formerly South London) Entomological and Natural History Society and referred to in 1 below (with corrections to dates as listed by Hall 1977 : 75, footnote) are indicated SL, as in my previous paper. Editorial comments are in square brackets.

HISTERIDAE

In general these beetles are oval in shape and many are adapted to live in dung or bird litter.

Gnathoncus schmidti Reitter iii 77 (2)
Saprinus semistriatus (Scriba) (3)
S. virescens (Paykull) (3). This species preys on the larvae of the chrysomelid genus *Phaedon.*
Dendrophilus punctatus (Herbst) iii 77 (2)
Hister striola C. R. Sahlberg v, vi 65 (4)
Atholus duodecimstriatus (Schrank) (3)
Grammostethus marginatus (Erichson) vi 65 (4)

PTILIIDAE

These are amongst the smallest beetles in the world – only a few exceeding 1 mm in length. Considerable revision of this family has taken place in recent years, and many species of the genus *Acrotrichis* (=*Trichopteryx*) have been declared *incertae sedis.* Coulson (1942) recorded *T. longula* (A. Matthews), but this should now be deleted for lack of evidence.

Ptinella aptera (Guérin-Méneville) iii 77 (2)
Acrotrichis arnoldi Rosskothen v, vi, vii 65 (4). This was the first British record.
A. cognata (A. Matthews) iv, v, vi 65 (4)
A. fascicularis (Herbst) v, vi 65 (4)
A. grandicollis (Mannerheim) iv 65 (4)
A. intermedia (Gillmeister) (3)
A. sericans (Heer) (3)

---

*Deceased May 1978; an obituary appears in this issue.

LEIODIDAE

This family contains 92 British species. All are small and are found in vegetable matter and carrion.

Leiodes calcarata (Erichson) (3)
Agathidium nigrinum Sturm v 52 SL
Nemadus colonoides (Kraatz) iii 77 (2)
Nargus velox (Spence) iv 65 (4) and ix [? year] Dr Bannister
N. wilkini (Spence) ix 65 (4)
Sciodrepoides fumata (Spence) vi, vii 65 (4)
S. watsoni (Spence) iv 65 (4)
Catops coracinus Kellner iv, v, vi, vii, viii 65 (4)
C. fuliginosus Erichson ix 68 Dr Bannister
C. kirbii (Spence) xii 64, i, iii, iv, vi, vii, xi 65 (4)
C. longulus Kellner iv 65 (4)
C. nigricans (Spence) iii 65 (4)
C. nigrita Erichson iv, v, vii, viii 65 (4)
C. tristis (Panzer) xi, xii 64, i, ii, iii, iv, v, vi 65 (4)

SILPHIDAE

All members of this family are carrion feeders, with the exception of *Dendroxena quadrimaculata* which feeds at night on lepidopterous larvae on oak trees.

Nicrophorus humator (Gleditsch) iv 43 (5)
N. vespillo (Linnaeus) iv 39 SL
Thanatophilus rugosus (Linnaeus) (3)
T. sinuatus (Fabricius) iv 39 SL
Oiceoptoma thoracicum (Linnaeus) iv 43 (5)
Dendroxena quadrimaculata (Scopoli) v 49 DGH
Silpha atrata Linnaeus xii 43 (5), i 49 DGH

SCYDMAENIDAE

The 30 British species in this family are mainly confined to leaf litter. Only two have been found on Bookham Common.

Stenichnus collaris (P. W. J. Müller and Kunze) (3)
Scydmaenus tarsatus P. W. J. Müller and Kunze v 52 SL

SCAPHIDIIDAE

This is a small family, with only five British species which are found in fungoid growth in rotten wood.

Scaphidium quadrimaculatum Olivier iv 38 SL
Scaphisoma agaricinum (Linnaeus) ii, viii 49 DGH

PSELAPHIDAE

Small species that may be found by examining grass tussocks. They are pugnacious in habit and feed on mites and wingless soil-inhabiting insects.

Euplectus piceus Motschulsky (3)
Bryaxis bulbifer (Reichenbach) (3)
Rybaxis longicornis (Leach) vi 34, iv 57 SL
Brachygluta fossulata (Reichenbach) (3)
Reichenbachia juncorum (Leach) (3)
Pselaphus heisei (Herbst) [no date] Le Gros and Towns

CLAMBIDAE

Recent work on this small family has placed many of the old records in doubt, but the one species recorded from Bookham can be accepted.

Clambus punctulus (Beck) iv, v, vi, vii, viii, x 65 (4)

BYRRHIDAE

This small family – only 12 British species – are commonly known as pill-beetles.

Simplocaria semistriata (Fabricius) [data omitted]
Cytilus sericeus (Forster) – 52 SL

HETEROCERIDAE

Although there are only eight British species, they are particularly difficult to identify, and collectors should consult the 1973 *Handbook Ident. Br. Insects* **5** (2 c). Both species recorded at Bookham are common.

Heterocerus fenestratus (Thunberg) iv 39 SL
H. marginatus (Fabricius) [data omitted]

DRYOPIDAE

This again is a small family – eight British species – and is to be found in the lank vegetation at the edge of ponds.

Dryops auriculatus (Fourcroy) [data omitted]
D. luridus (Erichson) [data omitted]

DERMESTIDAE

This family comprises a large number of cosmopolitan species, and many have been introduced with furs and skins which is their normal habitat. All the species recorded from Bookham are regarded as indigenous.

Dermestes murinus Linnaeus iv 39 SL
Attagenus pellio (Linnaeus) vi 04 SL
Ctesias serra (Fabricius) vi 52, at weeping ash, SL
Anthrenus fuscus Olivier [data omitted]

REFERENCES

1. BEVEN, G. 1968. Twenty-five years of the Bookham Common survey, including a note on the increase of scrub on grassland. *Lond. Nat.* **47** : 95 – 102.

2. JONES, R. 1978. Beetles in a disused owl's nest. [*In* Survey of Bookham Common: thirty-sixth year. Progress report for 1977.] *Lond. Nat.* **57** : 64.

3. COULSON, F. J. 1942. Coleoptera of Bookham Common. *Proc. Trans. S. Lond. ent. nat. Hist. Soc.* **1941 – 42** (II) : 51 – 61.

4. EASTON, A. M. 1967. The Coleoptera of a dead fox (*Vulpes vulpes* (L.)); including two species new to Britain. *Entomologist's mon. Mag.* **102** : 205 – 210.

5. PAYNE, L. G. 1945. Coleoptera of Bookham Common: some extracts from my notebook, 1943. *Lond. Nat.* **24** : 31 – 35.

HALL, D. G. 1977. Coleoptera of Bookham Common: Hydradephaga. *Lond. Nat.* **56** : 75 – 76.

Book Review

The Endless Village. By W. G. Teagle. 58 pp in A4 size, amply illustrated in black and white. Nature Conservancy Council, West Midlands Region, Attingham Park, Shrewsbury SY4 4TW. 1978. £1.00, post free.

Subtitled *The Wildlife of Birmingham, Dudley, Sandwell, Walsall and Wolverhampton,* this most attractively produced publication, written by our long-standing member Bunny Teagle, shows, in the words of the Director of the NCC in his Foreword " . . . how wildlife has adapted itself to an urban environment and now provides a rich source of enjoyment to the city dweller." It is based on 'The West Midland Wildlife Survey' and is the first part of the Conservancy's national project 'Nature Conservation in Urban Areas'.

Mr Teagle is well known for his expertise as an all-round naturalist, and especially as an authority on urban natural history.

The study area as defined in the subtitle covers about 560 square kilometres of built-up land – The Black Country. Topics covered include its basic geology and physiology, which of course still play an important part in determining the flora and fauna of any area. The growth and development of the industrial/urban complex of the West Midlands are traced over the last two and a half centuries in conjunction with a survey of the land use history, industrialization, housing, railways, motorways, parks, gardens and wasteland – 'The jumbled mosaic'. A number of the plants and birds referred to are accompanied by maps showing their West Midlands distribution and some are compared with that of the British Isles as a whole, for instance the wild parsnip, which is on the edge of its range in the survey area. The gardens, wayside and legacies of industry are all interestingly described, as are the more natural habitats, the open spaces, urban wilds and water.

The last chapter, with G. M. A. Barker as co-author, is entitled 'A way ahead' and it concludes on a theme that is applicable to all heavily built-up areas: "Over-riding all, is the need to interest people in their wildlife heritage, to make it clear that the crowded towns are by no means devoid of natural history interest, and to develop through both formal and informal education, a knowledge of the fauna and flora of the area and the desire for its continued existence . . . ".

All the species of plants and animals mentioned in the text are listed in the first appendix, whilst the second lists all local natural history interests.

It is interesting for us to make our own comparisons between the West Midlands conurbation, with its fusion of originally scattered townships, and London with its concentric growth and urban, suburban and Green Belt zones.

To sum up, a most stimulating publication which should be read by all who are concerned with our heritage of wildlife. We are especially proud in the knowledge that who else but Bunny Teagle could have written such a readable essay.

K. H. Hyatt

Conservation in the London Area 1978

by L. M. PEARL SMALL*

This has been a busy year for the London Nature Conservation Committee with motorway routes, particularly the M 25, always on the agenda.

As far as personnel is concerned we have lost probably the best secretary the committee ever had when Ann McCord left London for her new post in Reading. For a time we had no secretary, but now Mrs Susan Joy has taken over.

Hampstead Heath is a permanent item on the agenda with fencing, or rather the lack of it, one of the biggest problems. The GLC have now promised to set aside an annual sum for this purpose. The plans for Hendon Archaeology Society digs on the Heath were discussed to ensure that any damage would be minimal, and they deserve commendation for a truly careful conservation programme. Scrub clearance on West Meadow Bog has been started and will be finished next year. Much *Glyceria* has been removed from the top Highgate Pond and for some unknown reason double daffodils have been planted in this nature reserve.

The disused railway line north of Finsbury Park has caused much discussion as Haringey Council wish to use it for housing more intensively than many feel is necessary, but it now looks as if the wishes of conservation bodies will be taken into account. We were consulted about conservation work in Alexandra Palace Park and on investigation received a helpful reply from the Council.

Stephen Rettig joined the committee because of his concern for Holland Park. Much felling of diseased trees has been done and unfortunately exotic trees used for partial replacement. Rubbish had been added to the leaf mould heaps and fencing was bad. Pressure has caused the GLC to move the rubbish, promise the planting of more native trees and replacement, when financially possible, of more fencing.

Harefield chalkpit, where the geological exposures were being obscured by rubbish, has been cleared by the work of the Harrow and Ruislip Geological Society. The Herts. and Middlesex Trust for Nature Conservation has completed the purchase of Old Park Wood at Harefield, well-known for its varied and interesting flora.

The scrub clearance of an area of Wimbledon Common of vital importance to small breeding birds was, at our request, taken up with the conservators by the Nature Conservancy Council. We were consulted about the siting of a Sunday market on Mitcham Common and, as it did not encroach on important areas, agreed with the proposal. We are now concerned with the proposed development plans for Beddington Sewage Farm, used for bird observation by the Society for many years. There was a proposal to site a football pitch on the edge of Bookham Common and we supported the protests of the National Trust that cars attracted to the area might well encroach and spoil another of our work areas.

A great deal of time recently has been spent on Lapse Wood, an area of semi-natural woodland in Dulwich with a great deal of potential for outdoor biological work, which is under threat of destruction by housing development.

---

*13 Woodfield Crescent, Ealing, London W5.

We have been consulted on the schedule of proposed Sites of Special Scientific Importance in Kent. In co-operation with Orpington Field Club we are investigating proposed pond clearance on Keston Common by Bromley Council. A proposal to use Covert Wood, Orpington, for housing was refused planning permission after the receipt of many protests, including ours.

In the Essex part of our area, the Wren Conservation Group, with Colin Plant as representative on the committee, has been very active in trying to save the trees of Wanstead Park from total destruction and we have supported their efforts. They have also succeeded in having St Mary's churchyard in East Ham established as a nature reserve. We were able, with the help of the British Museum (Natural History), to provide leaflets when the Beckton area was invaded by a plague of brown-tail moths. Outside the London Area we give support when areas, such as Amberley Wild Brooks, important to our members, are threatened.

Members of the committee serve on other bodies and so keep us in touch with their work. Major Lowe serves on the Regional Council for Sport and Recreation, where he is the lone voice representing the needs of wildlife but nevertheless he can alert us when sites, such as Queen Mary Reservoir, are under pressure by sporting activities. Miss Davis keeps us in touch with the work of the Wandle Group, who have worked to clean up the River Wandle with most satisfactory results.

Miss McCord represented us on the Port of London Conservation Committee, and temporarily this work will be taken over by the Chairman who is already a committee member. The Chairman also represents the committee on the Colne Valley Naturalists' Liaison Committee, which has met regularly since the inception of the Colne Valley Park scheme, with the object of ensuring the best treatment for the primary natural history sites in the valley.

The route of the M 25 has been the object of a public enquiry at Leatherhead, where Ashtead Common, an SSSI, is under threat and the land offered in exchange falls far below the quality of that taken; Mr. Butler has been giving evidence on the committee's behalf. On 9 January 1979 a further enquiry opens at Staines where once again Staines Moor is threatened. Surrey Trust for Nature Conservation are opposing the route and the Colne Valley Committee will also be putting our case.

Botanical Records for 1978

by R. M. BURTON*

Summary

The principal discoveries and re-discoveries of vascular plants in the London Area in 1978 are reported, together with a few from earlier years not previously published. *Cerastium brachypetalum* has been found in Kent. *Euphorbia platyphyllos* in Kent, *Linum bienne* in Surrey and *Rumex maritimus* in Middlesex have reappeared after long intervals, and *Luzula forsteri,* described from Essex, has been refound there after a century and a half.

Introduction

After the *annus mirabilis* of 1977 the number of remarkable plant records in the area dropped. Whereas 1976 had produced an extremely hot dry summer followed by a wet autumn, resulting in surprising germination of many uncommon annuals flowering in the next year, 1977 had a less unusual summer and rather dry autumn. However many records of *Trifolium striatum* in 1978 suggest that this species at least has held on to much of the ground gained in 1977, or perhaps the effect mentioned was for some reason delayed a year locally.

During 1977 K. Rostański, the authority on European *Oenothera,* visited Britain and examined a large quantity of herbarium and living material, especially of plants which up to then had been referred to *O. parviflora* L. He found no evidence that the true species has ever been found in this country and identified many plants with other species, including *O. cambrica,* his description of which had not yet appeared. Dr. Rostański's publication (1977) refers only to plants of Welsh origin, but on his visit he also found that the new species had been gathered elsewhere. The only plant from the London Area named by him was gathered by J. R. Palmer on 10 August 1974 in a chalkpit at Stone, W. Kent, where it was abundant, along with *O. perangusta* Gates. This colony was destroyed by tipping in 1976. However, the species is still present in the area; a colony in a car-park near Wapping, Middlesex, found on the Society's excursion of 29 July 1976, is *O. cambrica* and was still extant in 1978. Other evening primroses which might be the same occur near Mitcham Junction Station, found by B. Wurzell in 1963 and again by Miss P. Bartlett in 1976 – 78, and in a filled-in chalkpit at Harefield, found by Mrs M. V. Marsden in 1978. Adequate material from these two localities is still needed. A good specimen should consist of a plant with several unopened flower-buds at the top and mature fruit above the bottom, making a large herbarium sheet; some petals should be pressed separately. Important characters in *Oenothera* include the overall shape of the inflorescence, the size and shape of the petals, and the attitude of the tips of the sepals beyond the area enclosing the petals in the unopened bud, all features which may be lost in inadequate specimens.

Bidens connata Muhl. ex Willd., the first British record of which appeared here a year ago (Burton 1978), was found in many places in 1978, all except one in this Society's area. The plant is now known in Herts. and Bucks. as well as Middlesex. Fuller information about the occurrence of this and other species of *Bidens* is given in a separate paper in this issue.

The records which follow are arranged in the usual sequence of vice-counties. As many as possible are placed in a tetrad, i.e. an area 2 km square; the way these tetrads are numbered is explained by Sandford (1972). Botanical names given without their authors are those recommended by Dandy (1958).

---

*Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent.

Records

V.C. 16, West Kent

The most remarkable botanical discovery to report within 32 km of St Paul's Cathedral is again due to J. R. Palmer, who found *Cerastium brachypetalum* near Longfield. This was first seen in 1977 and investigated more thoroughly in 1978, when it was found to occur in fair quantity over 100 m of vegetation which otherwise consists wholly of native species, including *C. glomeratum* and *C. holosteoides*. The only other known British locality for *C. brachypetalum* is in Bedfordshire in a not dissimilar situation, but the plants are different. The Beds. plants are of subsp. *brachypetalum*, but the Kent ones have the dense hair-covering of the stems and the pedicels much more appressed, indicating subsp. *tenoreanum* (Ser.) Soó, which has a more southerly continental distribution.

It is hard to choose from among Mr Palmer's many other fascinating records, which reflect his interest in the alien flora so well represented in N.W. Kent. He found *Rumex patientia* and its hybrid with *R. obtusifolius* at Green Street Green (57T80); here too was *Filago germanica*. *Bidens frondosa*, a few plants of *Verbascum bombyciferum* Boiss., *Acanthus mollis*, the colour form of *Lythrum salicaria* which is grown in gardens and *Vicia villosa* subsp. *villosa* were on a tip at Stone (57T64), but the *Vicia villosa* nearby at Horns Cross was subsp. *pseudocracca* (Bertol.) P. W. Ball which has fewer flowers together and different calyx-teeth, and must therefore have been of different origin. Subsp. *pseudocracca* often has prettily variegated flowers, but this is not a reliable character, as will be seen later. *Verbascum speciosum* occurred in a number of places along the course of a recently buried pipeline in the Darent valley (56T68, 57T60). With C. G. Hanson, E. G. Philp and B. Wurzell, Mr Palmer found hundreds of seedlings of *Ceratonia siliqua* L. on an industrial dump at Greenhithe; this leguminous species matures into a small tree which is commonly grown in Mediterranean countries for its massive sweetly pulpy pods which are fed to animals. Its unprecedented occurrence here sugests that a firm imported these for sale in this country and then had second thoughts. Other plants from this site were *Amaranthus albus, Conyza bonariensis* (L.) Cronq., *Echinochloa colona* (L.) Link, *Eragrostis neomexicana* Vasey and *Sida spinosa* L. Continuing the researches which led to his publication (Palmer 1977), Mr Palmer again visited the neighbourhood of the Thames-side oil mill where soya beans are imported in bulk, and found inter alia *Abutilon theophrasti* Medicus, *Ambrosia trifida* L. exceeding 2 m in height and up to 400 m from the works, *Chenopodium probstii* Aellen, *Ipomoea hederacea* Jacq., *I. purpurea* Roth and *Sida spinosa; Helianthus petiolaris* Nutt. grows in the cracks of the river-wall and sets good seed, so it may have become established. This species was also noticed in the pit at Stone which, in some years past, has produced a good crop of soy-bean aliens, as were *Echinochloa colona, Lablab purpureus* Sweet and fenugreek *Trigonella foenum-graecum* L. Seeds of the last, which Mr Palmer also found on a dump (57T84) east of Greenhithe church, are increasing in commerce as a result of the current fad for eating seedlings. In a marrow field at Stonehill Green (57T00) he saw *Chenopodium probstii, Erodium moschatum, Malva pusilla* and *Medicago polymorpha*, all believed to have been introduced with wool waste used as a soil conditioner at least 15 years before. He found a seedling of *Laurus nobilis* L. in Beacon Woods, Bean (57T80); here too was *Genista tinctoria*, and another valuable record of a native species is *Trifolium ornithopodioides* at Lane End (57T60), reappearing after an interval of 27 years.

G. S. Joyce again sent a list full of interest. In Farningham Wood (56T48), already well known to botanists, he discovered a totally unexpected colony of *Helleborus viridis* numbering well over 100 plants. Also in the wood he found

Juncus kochii, and at its edge (56T46) several plants of *Carex polyphylla.* Otford Station car park (55T28) is his unlikely locality for *Barbarea intermedia* and in a cornfield at Eynsford (56T26) he found *Valerianella dentata;* this is near my home but I have not been able to find it there since 1971. Dr Joyce saw one plant of *Tragopogon porrifolius* on a roadside (57T62) near Swanscombe and six more in a hedgerow (56T28) near Swanley, which were brought to his attention by Mrs Metaxis who teaches at a local primary school. In the sown grass of a newly constructed golf-course he found *Vicia villosa* with variegated flowers.

Mrs J. Pitt's list makes it plain how much time she has spent collecting facts to support the Orpington Field Club's case for presentation at the public enquiry into the Sevenoaks-Swanley part of the proposed M 25 motorway. The most important part of this botanically is the spur cutting through the capping of Tertiary gravels in Hollows Wood (46T82) where she found *Blechnum spicant,* plentiful *Hypericum maculatum* on the clay below and *Carex demissa,* abundant *Scirpus setaceus* and *Blackstonia perfoliata* in an unusual habitat in a seepage line. The course of another section of the motorway has already cut through Westerham Wood (45T44) where the plants she recorded in 1978 included *Carex strigosa, Oenanthe aquatica* and *Scirpus setaceus.* Among her other finds I should mention *Aira caryophyllea, Myosotis discolor* and *Trifolium striatum* on Sundridge Park golf-course (47T00), *Saxifraga granulata* near Ruxley Gravel-pits (46T48) in the same area as *Verbascum blattaria* which reappeared after several years' absence, *Gymnadenia conopsea* in a working sand-pit (45T22) near Westerham and *Myriophyllum brasiliense* Cambess. from the pond in Darrick Wood (46T44).

J. Williams, new to our files, discovered about 50 plants of *Euphorbia platyphyllos* at the edge of a chalky field (46T00) near Biggin Hill. This is only the second record of this rare weed which we have ever had from v.c.16. In the same neighbourhood P. Jupp detected about 15 spikes of *Monotropa hypopitys.* R. A. Boniface revisited a meadow near Shoreham (56T22) which, in spite of some deterioration in the habitat, still has *Caltha palustris, Dactylorchis incarnata* and *Saxifraga granulata.* At Eynsford Castle (56T44) I saw two plants of *Verbascum lychnitis* on top of the highest flint wall, indicating that this species is dispersed by wind, and *Ranunculus lingua* in the river. I found *Medicago arabica* on a soil heap in the corner of a playing-field at Bellingham (37T62). K. White told me of *Lathyrus nissolia* south of Catford (37T62) between the railway and the Pool River; this was also abundant there in 1977. Our meeting of 17 June added *Cephalanthera damasonium* to the long list of orchids known from Darwin's Bank (46T20) near Downe.

V.C. 17, Surrey

For our most remarkable Surrey records this year we have to thank R. A. Boniface. In 1977 he found a number of plants of *Linum bienne* near the Hogsmill River at Tolworth (16T84); this is the first record of wild flax in the county for many years and Lousley (1976) regarded it as extinct. On Walton Common (06T84) he re-located *Teesdalia nudicaulis* in what appears to be its only extant locality in our area. Other plants in his fine list for this common include *Potentilla argentea,* last seen there about 50 years before by A. H. Wolley-Dod, *Trifolium subterraneum* and a handsome garden-escape *Coreopsis grandiflora* Nutt. ex Chapman. The reappearance of native species here may be connected to the clearance of war-time buildings a few years ago. Mr Boniface found a few plants of *Ceterach officinarum* on the wall of Sunbury Lock (16T08), a surprising discovery. Nearby were *Carduus nutans, Spergularia rubra* and a single *Onopordon acanthium.* In 1977 he found one large plant of *Rumex palustris* on West End Common, Esher (16T22).

1978 saw the beginning of work on a five-year survey by the Croydon Natural History and Scientific Society of the flora of its area, which extends north as far as Wimbledon (27T00) and Chislehurst, Kent (47T40), and south just beyond our own limits. In the course of searches in their first year, the best discovery which has come to my notice was by Mrs J. F. Byatt and E. C. Wallace of *Ranunculus sardous* at Waddon (36T04), not previously detected in this part of Surrey. They also inspected old walls at Beddington (26T84), already well-known for the quality of their cryptogamic flora, and found *Poa compressa* and *Saxifraga tridactylites*. On Wimbledon Common (27T20) Dr Byatt and Mr Wallace found *Trifolium striatum*, last seen there in 1945; other plants still on the common are *Carex disticha, C. muricata, C. spicata* and *Salix aurita*.

The William Curtis Ecological Park in Southwark (38T20) has come in for a great deal of attention. Many species have been deliberately introduced here. Others of mysterious origin possibly came in when the site was used as a lorry park. Of these the best were a single plant of *Trifolium echinatum* Bieb., a very rare casual in this country, native in S.E. Europe and W. Asia, and *Vicia villosa*. Both of these have been wrongly determined by myself and I am grateful to E. J. Clement for his corrections; the latter appeared in print last year (Burton 1978) as *V. cracca*. It has variegated flowers but its rather long calyx teeth with long white hairs show that it is *V. villosa* subsp. *villosa*.

Mrs L. M. P. Small reports *Corydalis solida* established in Coombe Wood, Addington (36T44); she had also seen it there in 1970, but had not identified it. Dr T. A. Cope made the surprising discovery of a single plant of *Orchis morio* near Box Hill (15T62). Miss M. B. J. Clark told me of *Epilobium lanceolatum* in Betchworth quarry (25T00). A Wild Flower Society meeting in August went to East Sheen Common (17T84) and found *Equisetum x literale* and *Fragaria moschata*, the latter determined by R. J. Pankhurst. Another surprising discovery in the course of this meeting, which was conducted by J. M. Mullin, was a plant of *Gamochaeta purpurea* (L.) Cabrera outside the churchyard on Kew Green (17T86); there does not seem to be a previous published record of this North American composite wild in Britain, though there is a specimen in the herbarium at Kew collected outside the Gardens' Cumberland Gate in 1944 and a wool-alien specimen collected by Miss M. McCallum Webster at Blackmoor, N. Hants. There is much doubt whether *Gamochaeta* should be separated from *Gnaphalium*, and how the plants, which vary continuously in their American range, should be divided into species.

On Bookham Common Dr G. Beven came across *Dactylorchis praetermissa* on Central Plain (15T24), and B. R. Radcliffe reports the recent arrival of *Lagarosiphon* in South-eastern Pond (15T24). On Bayfield Plain (15T26) K. Page saw *Scirpus setaceus* in some quantity on a grassy path; it was last noticed on the common 27 years earlier. Mr Page found a massive stand of *Sasa veitchii* (Carr.) Rehder on Esher Common (16T22), locally dominant and thriving under mature beech. He also recorded abundant self-sown *Pinus nigra* Arnold, some of it up to 3 m in height, on chalky banks of the Leatherhead bypass (15T64), where it was shown to our meeting of 24 September, together with seedlings of *Larix decidua* and *Tilia platyphyllos*.

Mrs E. Norman's reports include *Polygonum dumetorum* reappearing in the Wimbledon road (27T20) where Mrs B. Welch knew it in 1947 – 54 (in the interval it has appeared intermittently elsewhere in the neighbourhood) and *P. campanulatum* "still hanging on" on Wimbledon Common (27T20) where it was last reported to us by the late D. S. Warren in 1969. She found a patch of *Allium paradoxum* in College Road, Dulwich (37T20). W. G. Teagle rightly thought it worth mentioning *Sherardia arvensis* by a kerb in Wandsworth (27T42). Miss O.

Maunder had *Bromus unioloides* from Ham Common near Ham Gate (17T80), where it was plainly something other than *B. carinatus* which grows not far away, identified for her by R. C. Stern; it disappeared soon afterwards. W. A. Vickers found *Medicago falcata* on Wimbledon Common (27T20) where it was previously noted by C. Avery in 1942 and J. D. Lovis in 1951. The same species was seen near Nutfield (35T00) by Miss E. M. C. Isherwood, who also told me of *Trifolium incarnatum* on a sown verge in that area and *Scrophularia vernalis* in Betchworth chalkpits (25T00). P. C. Hall had *Kickxia elatine* and *Portulaca oleracea* as weeds in his garden at Cobham (16T00), and two plants of *Chrysanthemum segetum* nearby. I found *Hieracium trichocaulon* adorning the wall of my brother's garden at Richmond (17T82).

V.C. 18, South Essex

Luzula forsteri was described as a new species in 1804 on the basis of specimens collected by Edward Forster between Hoghill and Collier Row in Hainault Forest. Since that date there has been no further adequate evidence of its occurrence in Essex, and it was therefore a great thrill for botanists in the county when it was rediscovered there in 1977. A. D. Boniface found one poor plant in a wood (58T88) which is to be lost to another stretch of the M 25 motorway. Fortunately a second site nearby was located by Mrs J. M. Adams, and here the plants are more numerous, healthy and safe. Forster is also commemorated by the rare moss *Zygodon forsteri* (Brid.) Mitt., and this too has recently been restored to the Essex flora after a long interval.

Some good finds were made by our meeting of 30 July, led by K. J. Adams. In a filled-in sand-pit (57T88) near Grays were *Apera spica-venti* and *Trifolium striatum* and on the bare Thanet Sands surface were one *Anthyllis vulneraria* and numerous *Blackstonia perfoliata*. In Mill Wood House chalkpit (57T88) to the south we found *Carduus tenuiflorus* and *Scirpus maritimus*, two submaritime species additional to those named in the report of an earlier meeting here (Burton 1976), as well as *Anacamptis pyramidalis, Hieracium lepidulum*, abundant *Echium vulgare* and two plants of *Nepeta cataria*. The last two are considered to be very local in S. Essex, yet later that day I discovered a much larger population of the *Nepeta* close to the Thames (57T48) west of Purfleet. Other plants in this area were *Carex divisa, Geranium rotundifolium, Parapholis strigosa* and *Puccinellia fasciculata*.

These are common species by comparison with *Lactuca saligna*. This was last reported at Purfleet in 1920 by L. B. Hall. Throughout the last war, and for many years after, this stretch of river frontage was inaccessible and knowledge of the plant was lost. After my rediscovery of it, the site was investigated more thoroughly by A. D. R. Hare who estimates that the 1978 population consisted of about 500 plants. Only three other places in Britain are known where *L. saligna* has a permanent foothold.

V.C. 20, Herts.

The only previous record of *Trifolium glomeratum* in Herts. is a casual occurrence at Easneye in the last century. In 1978 A. D. Marshall found five plants near Essendon, on the edge of a fairway of a recently constructed golf-course (20T66), with *T. striatum*. It would be unwise to assume that these are long dormant or overlooked natives, bearing in mind the possibility of their introduction in grass seed, suggested by the occurrence of an alien *Vicia* in a similar locality in Kent, mentioned above. *Potamogeton pectinatus* was in water nearby. Mr Marshall also reports the continued existence of *Scrophularia vernalis* in Hatfield Park (20T28). P. D. L. Maurice found *Ranunculus arvensis* on a building site in Rickmansworth (09T64).

Our meeting of 21 May went to a wet meadow (31T02) at Hertford, with *Carex paniculata* and at least four other sedges, and *Anthriscus caucalis* at its edge. The meeting of 6 August saw the fruit of *Lepidium heterophyllum* in its only Herts. locality on the course of a vanished railway (border of 09T64 and T84) east of Rickmansworth. *Galeopsis bifida* was on the side of a bridge further west, and the water of a flooded gravel-pit had *Callitriche intermedia* and *Elodea nuttallii* among the much more abundant *E. canadensis*.

V.C. 21, Middlesex

R. Carter found *Rumex maritimus* in Whitewebbs Park, Enfield (39T28) in 1974 but did not report it then. It is the first record of the species in Middlesex since 1924. *R. palustris* is more common in rather disturbed wet places in the London Area. In 1978 B. Wurzell found it abundantly near Northolt (18T22) and the Wild Flower Society party mentioned above saw it in a number of places; by a small pond in Moor Lane (07T22), Staines, it was with its hybrid with *R. obtusifolius*. In Tottenham (38T48) Mr Wurzell found *Aster tripolium, Atriplex littoralis, Spergularia marina* and other estuarine species in an improbable situation at the base of a newly planted tree in a housing estate. In another locality he collected *Agrostis gigantea* x *stolonifera,* obvious from its alarming combination of rhizomes and stolons and other mixed characters.

D. H. Kent reports *Stellaria graminea* and two plants of *Rumex triangulivalvis* in Stepney churchyard (38T60), and *Dryopteris dilatata* in Tower Hamlets Cemetery (38T62). *Aubrieta deltoidea* (L.) DC. and *Hypericum inodorum* Mill. are well established, he tells me, on the river-wall of the Thames at Staines (07T20). Mr Kent also communicated to me the discoveries by J. G. Robinson in 1977 of *Allium triquetrum* on a railway bank at Chiswick (27T06), and by P. J. Cribb in 1978 of *Senecio* x *ostenfeldii* on Shortwood Common (07T40), found independently by Dr Cope.

Again we have fresh discoveries from the grounds of Buckingham Palace (27T88) by D. McClintock. *Stellaria neglecta* occurred in 1978 as a single large plant in the rose-garden. Bird-seed aliens included *Lepidium densiflorum* Schrader and *Euphorbia hirta* L., the latter a pan-tropical weed not previously recorded in Britain. It is unlikely that either of these would have been identifiable had not Mr McClintock noticed them as small plants of unfamiliar appearance and grown them on to maturity.

Dr Joyce saw *Oenanthe crocata* and *Ranunculus sceleratus* growing between the slabs of the Victoria Embankment (38T00), and *Melilotus alba, M. indica, Sisymbrium loeselii* and *Stachys sylvatica* on a building site near St Paul's Cathedral (38T20) made accessible for the sake of visits to an archaeological excavation. Mrs M. V. Marsden's finds include *Datura stramonium* on a soil mound in a filled chalkpit at Harefield (09T40), *Trifolium striatum* on sand in the same area (08T48) and *Senecio sylvaticus* on Barn Hill, Wembley (18T86). She collected flowers from a *Utricularia* which was sterile when first discovered in a pond at Stanmore (19T62) (see Lousley 1970) and had them confirmed as *U. vulgaris* at the British Museum (Natural History). Darlands Lake (19T42) is south of Totteridge but just in v.c.21; Mrs Small and others saw *Fritillaria meleagris* and *Corydalis solida* here, apparently as ancient introductions. It has been suggested that the locality is the same as one mentioned by Trimen & Dyer (1869), but that was north of Totteridge and in Herts. Mrs Norman mentioned *Impatiens parviflora* in the grounds of Bedford College (28T82), and *Picris hieracioides* and abundant *Sison amomum* in Holland Park (27T48). Dr Maurice found *Erophila verna, Lemna trisulca, Montia fontana* and *M. perfoliata* growing in Golders Green Garden of Remembrance (28T46) and *Sherardia arvensis* in the grounds of the Central Middlesex Hospital (28T02). My own Middlesex observations are limited to *Mycelis muralis* at Hampton Court (16T48), one *Artemisia annua* L. by the Regent's Canal (28T62) and *Apium graveolens, Foeniculum vulgare* and *Sinapis alba* all in Wapping High Street (38T40) near the premises of the British Pepper & Spice Co.

R. A. Boniface sent very useful lists of earlier years' finds on Staines Moor (07T22) and Hampton Court Park. He visited the latter again in 1978, finding one plant remaining of *Nepeta cataria,* but also *Myosotis discolor, Thymus pulegioides, Trifolium striatum, Verbascum nigrum* (all 16T66) and *Hyoscyamus niger* (16T48).

V.C. 24, Bucks.

Mr Boniface kindly sent lists from Buckinghamshire. The flora of a marshy field (08T26) near Denham which he visited in 1972 included *Cardamine amara, Carex disticha* and five other sedges, *Galium uliginosum* and *Oenanthe crocata.* In 1978 he went to Langley Park and found some remnants of wet heath (08T02), with *Carex binervis, Hypericum elodes, Potamogeton polygonifolius, Scutellaria minor, Juncus bulbosus, J. squarrosus, Nardus stricta* and *Potentilla anglica.* The last three have not previously been reported to the London Natural History Society from the small part of vice-county 24 within 32 km of St Paul's Cathedral.

References

BURTON, R. M. 1976. Botanical records for 1975. *Lond. Nat.* **55** : 44 – 47.

BURTON, R. M. 1978. Botanical records for 1977. *Lond. Nat.* **57** : 70 – 80.

DANDY, J. E. 1958. *List of British Vascular Plants.* British Museum, London.

LOUSLEY, J. E. 1970. Botanical records for 1969. *Lond. Nat.* **49** : 7 – 19.

LOUSLEY, J. E. 1976. *Flora of Surrey.* David & Charles, Newton Abbot.

PALMER, J. R. 1977. Oil-milling adventive plants in north-west Kent 1973 – 6. *Trans. Kent Field Club* 6 : 85 – 90.

ROSTAŃSKI, K. 1977. Some new taxa in the genus *Oenothera* L. subgenus *Oenothera,* part 3. *Fragm. Florist. Geobot.* **23** : 285 – 293.

SANDFORD, H. A. 1972. Recording maps and overlays. *Lond. Nat.* **51** : 20 – 21.

TRIMEN, H. & DYER, W. T. T. 1869. *Flora of Middlesex.* Hardwicke, London.

Amphibia and Reptilia in the London Area 1978

by PETER W. KING*

AMPHIBIA

GREAT CRESTED NEWT *Triturus cristatus* (Laurenti)

ESSEX. Garden pond at Forest Gate (TQ 4084), March, four or five.
SURREY. In gun-pits A and C at Bookham Common (TQ 1356), 11 April.

SMOOTH NEWT *Triturus vulgaris* (L.)

ESSEX. Baldwin's Pond area of Epping Forest (TQ 4297), 20 August, one.
KENT. In a small concrete pond at Anerley (TQ 3469), spawn also found. In and near lake in Kelsey Park, Beckenham (TQ 3768).
SURREY. Bookham Common (TQ 1356), 27 September, one dug up from dam of South-east Pond, 30 cm down; 14 October, one male dug up from disused yellow meadow ants' nest in Central Wood; 22 October, one dug up from floor of gun-pit C, a few cm down.

COMMON TOAD *Bufo bufo* (L.)

ESSEX. Garden pond at Forest Gate (TQ 4084), March, 529 removed by the Wren Conservation Group and dispersed to several other localities as follows: 100 liberated at Wanstead golf-course pond (TQ 4187), 100 at Wanstead Park (TQ 4187), 100 at Wanstead Park (TQ 4287), 100 at Wanstead Flats (TQ 4186), 100 at Wanstead golf-course pond (TQ 4087), and 29 at Eagle Pond (TQ 3989 & TQ 3988). Curtismill Green (TQ 5296), May, one seen. Baldwin's Pond area of Epping Forest (TQ 4297), 20 August, two.
HERTS. Darlands Lake Nature Reserve, Totteridge (TQ 2493), 25 July.
INNER LONDON. William Curtis Ecological Park, Southwark (TQ 3280): introduced, seen as late in the year as early December.
KENT. Small concrete pond, Anerley (TQ 3469). Beckenham Place Park (TQ 3870).
MIDDX. Garden of 47 Seaford Road, South Tottenham (TQ 3389).
SURREY. Croham Hurst (TQ 3363), 17 May, one; 28 June, one. Mitcham Common (TQ 2868), 30 July, one. Bookham Common (TQ 1356), 15 March, 30–40 mating and spawning in the Isle of Wight Pond; 30 March, spawn found in West Hollow Pond.

COMMON FROG *Rana temporaria* L.

ESSEX. Garden pond at Forest Gate (TQ 4084), March, 64 adults and much spawn removed by the Wren Conservation Group and transferred as follows: 34 and all the spawn to Wanstead golf-course pond (TQ 4087), 30 to Wanstead Park (TQ 4187). Curtismill Green (TQ 5296), 6 May, three seen. Baldwin's Pond area of Epping Forest (TQ 4297), 20 August, 12.
INNER LONDON. William Curtis Ecological Park, Southwark (TQ 3280): introduced but may have died out.
KENT. Beckenham Place Park (TQ 3870). Garden of 11 Gaynesford Road, Forest Hill (TQ 3673).
SURREY. Harborough Road, Streatham (TQ 3172), 1 June, one seen. Mitcham Common (TQ 2868), 30 July, one. Bookham Common (TQ 1356), 21 March, spawn in Isle of Wight Pond; 30 March, spawn in South-east Pond. Esher (TQ 1464), 28 January, two found under log in a garden. Both soon became active and hopped off.

---

*10 Mount Ephraim Road, Streatham, London SW16 1NG.

REPTILIA

Grass snake *Natrix natrix* (L.)

MIDDX. Trent Park, Cockfosters (TQ 2897), 8 October, one seen.
SURREY. Ashtead Park (TQ 1959), 23 April, one. Bookham Common (TQ 1356), 23 March, one sunning itself; 17 April, one at East Hollow Pond; 3 June, one at Isle of Wight Pond; 6 August, one; 10 September, two.

Common lizard *Lacerta vivipara* Jacquin

ESSEX. Baldwin's Pond area of Epping Forest (TQ 4297), 20 August, one.
SURREY. Ashtead Common (TQ 1759), 26 July, one. Bookham Common (TQ 1356), 10 September, one.

Slow worm *Anguis fragilis* L.

KENT. Beckenham Place Park (TQ 3870).
SURREY. Bookham Common (TQ 1356), 25 March, one found in a wood-pile.

INTRODUCED REPTILES

Terrapin *Chrysemys picta* (Schneider)?

INNER LONDON. Kensington Gardens, Long Water (TQ 2680). Seen on several occasions, the latest being on 7 October when two were together.

Garter snake *Thamnophis* sp.

ESSEX. Stratford-Plaistow area. There are several records of these popular pet snakes being found in the wild; they are generally recorded only in cold winter weather, possibly because feral specimens are being forced by the cold to move from one to another, more frost-proof, hibernaculum.

Advertisement

BOX HILL

by

Geoffrey M. Chapman & Robert H. D. Young

The authors, both sometime LNHS members, combine their 20 years association with the area into an account of the birds, wild flowers (special section on orchids), animals and insects of Box Hill, with chapters on geology and scenery, the Mole and its valley, trees and forestry, history and literary associations.

Landscape cover in colour. Many original photographs in colour and half-tone. Wildlife sketches, walkers' map, etc. A pleasing book for field or study.

Paperback 8″ x 5¾″ £2.25
Cased edition limited to 1000 numbered copies £3.75

From bookshops, or direct at £2.50/£4.25 post paid.

SERENDIP FINE BOOKS
11a BROAD STREET
LYME REGIS, DORSET, DT7 3QD

Mammals in the London Area 1978

by J. COTTON*

The number of mammal records submitted is declining, although those available suggest that several species may be increasing their ranges towards the centre of London. During the 1970s grey squirrels have been spreading in the Society's Inner London area. Wood-mice have spread into Inner London, while muntjac are said to be spreading in the suburbs. The single record in this report of a common seal suggests that the increased fish population of the Thames may result in more visits by marine mammals. If enough records, with grid references, are submitted over the next few years it may be possible to produce distribution maps, which, by comparison with earlier maps, should show changes in mammal distribution.

All records are gratefully received and entered in the Society's record books, although I have made no attempt to acknowledge by name those submitting records. Not all records are published here; reasons include (i) uncertainty as to species, especially for bats and small mammals; (ii) conflicting evidence – for example, different members have recorded droppings of muntjac and roe-deer in the Stanmore area; it is unsafe to publish either until it is clear that both species are present, or, if not, which one occurs; (iii) late submission of records for earlier years. Bat identification is a specialist task: if members can locate bat roosts and send in the details, it may be possible to arrange for expert identification.

The nomenclature and checklist numbers follow G. B. Corbet's *The Identification of British Mammals,* Ed. 2 (1969).

INSECTIVORA

1. HEDGEHOG *Erinaceus europaeus* L.

ESSEX. Collier Row, Gidea Park, Hainault Forest, Hornchurch, Nazeing, Romford.
HERTS. Cuffley.
KENT. Chislehurst, Mottingham, New Eltham, Sidcup.
MIDDX. Enfield, Hampstead Heath, Harrow Weald, Stanmore.
SURREY. Bookham Common, Streatham, Streatham Common, Wimbledon.

2. MOLE *Talpa europaea* L.

ESSEX. Bedfords Park, Curtismill Green, Hainault Forest, Havering, South Weald Park.
KENT. Chislehurst, St Paul's Cray.
MIDDX. Hampstead Heath.
SURREY. Bookham Common, Croham Hurst.

3. COMMON SHREW *Sorex araneus* L.

SURREY. Ashtead Common, Bookham Common, Tolworth.

4. PYGMY SHREW *Sorex minutus* L.

SURREY. Ashtead Common, Bookham Common, Tolworth.

---

*74 Kidbrooke Grove, London SE3 0LG.

CHIROPTERA

Only hand records are accepted for species. The following records from the bat recorder or sighting *(Plecotus)* are accepted for genus.

17/18. NOCTULE *Nyctalus* sp.

MIDDX. Brent Reservoir (bat recorder: probably *N. noctula* (Schreber)).

19. PIPISTRELLE *Pipistrellus pipistrellus* (Schreber)

MIDDX. Brent Reservoir (bat recorder).

21/22. LONG-EARED BAT *Plecotus* sp.

KENT. Chelsfield (species not known).

CARNIVORA

24. FOX *Vulpes vulpes* (L.)

ESSEX. Hainault Forest, Rainham Marsh.
INNER LONDON. Southwark Park.
KENT. Bromley, Chelsfield, Chislehurst, Dartford Heath, Elmstead, Eltham, Otford, Petts Wood, St Mary Cray, St Paul's Cray, Sidcup, Swanley.
MIDDX. Harrow, Harrow Weald, Hatch End, Pinner, Southall, Staines, Stanmore.
SURREY. Bookham Common, Coulsdon, Egham, Esher, Mickleham, Streatham, Surbiton, Wandsworth, Wimbledon.

27. STOAT *Mustela erminea* L.

SURREY. Bookham Common.

28. WEASEL *Mustela nivalis* L.

ESSEX. Hainault Forest, Rainham Marsh.
SURREY. Bookham Common.

31. BADGER *Meles meles* (L.)

SURREY. Egham, Mickleham, Roehampton, Selsdon, Wimbledon.

PINNIPEDIA

35. COMMON SEAL *Phoca vitulina* L.

SURREY. River Thames at Wandsworth Bridge.

ARTIODACTYLA

45. ROE-DEER *Capreolus capreolus* (L.)

SURREY. Bookham Common.

47. CHINESE MUNTJAC *Muntiacus reevesi* (Ogilby)

HERTS. Broxbourne Woods.
MIDDX. Iver Heath.

LAGOMORPHA

53. BROWN HARE *Lepus capensis* L.

ESSEX. Hainault Forest, Rainham Marsh, West Thurrock.
MIDDX. Hatch End, Stanmore.

55. RABBIT *Oryctolagus cuniculus* (L.)

ESSEX. Bedfords Park, Berwick Ponds, Curtismill Green, Epping Green, Hainault Forest, Havering, Navestock, Rainham Marsh.
HERTS. Cuffley.
KENT. Joyden's Wood, Otford, Petts Wood, St Mary Cray.
MIDDX. Hampstead Heath, Harrow Weald, Hatch End, Kempton Park, Stanmore.
SURREY. Bookham Common.

RODENTIA

57. GREY SQUIRREL *Sciurus carolinensis* Gmelin

ESSEX. Epping Forest, Hainault Forest, Havering, Hornchurch, Romford, South Weald Park.
HERTS. Northaw Great Wood.
INNER LONDON. Holland Park, Kensington Gardens, Regent's Park.
KENT. Beckenham Place Park, Chislehurst, Eltham, Green Street Green, Kidbrooke, New Eltham, Orpington, Otford, Petts Wood, St Paul's Cray, Sidcup.
MIDDX. Enfield, Hampstead Heath, Hampton Court, Harrow Weald, Hatch End, Stanmore.
SURREY. Ashtead Common, Bookham Common, Coulsdon, Dulwich Woods, Egham, Esher, Merton, Norwood, Streatham Common, Tooting Bec Common, Wandsworth, Wimbledon, Wimbledon Common.

62. WOOD-MOUSE *Apodemus sylvaticus* (L.) (trap records only accepted)

ESSEX. Chigwell (roadside verge of M 11), Epping Forest, Hainault Farm, Wanstead Park.
KENT. Beckenham Place Park.
SURREY. Ashtead Common, Bookham Common, Croham Hurst, Dulwich Woods, Norwood, Tolworth, Wimbledon Common.

62/63. *Apodemus* sp.

ESSEX. Colliers Row, Hainault.
MIDDX. Isleworth.
SURREY. Esher, Wimbledon.

64. HOUSE-MOUSE *Mus musculus* L.

A few records received from members; widespread in London.

66. BROWN RAT *Rattus norvegicus* (Berkenhout)

A few records received from members; widespread in London.

67. BANK-VOLE *Clethrionomys glareolus* (Schreber)

ESSEX. Chigwell (roadside verge of M 11), Epping Forest, Hainault Farm, Hainault Forest, Wanstead Park.
KENT. Beckenham Place Park.
SURREY. Ashtead Common, Bookham Common, Croham Hurst.

68. WATER-VOLE *Arvicola terrestris* (L.)

ESSEX. Rainham Marsh.
MIDDX. Rickmansworth, Stanmore.
SURREY. Esher.

69. FIELD-VOLE *Microtus agrestis* (L.)

ESSEX. Chigwell (roadside verge of M 11), Epping Forest, Hainault Farm, Wanstead Park.
MIDDX. Hampstead Heath, Stanmore.

Obituaries

DERRICK GORDON HALL, 1923 – 1978

Derrick Hall was born at Eastbourne on the 15 December 1923, and, apart from the period of the war and his army service – he served in the Royal Corps of Signals and the Royal Army Educational Corps and was posted to Germany, France and Denmark – he lived in the Clapham and Wandsworth areas of south London until moving to Cuffley in Hertfordshire in 1965. He died suddenly on the 2 May 1978.

Derrick was educated at the Henry Thornton Grammar School, Clapham. At the beginning of the Second World War he was evacuated with his school to Chichester on the Sussex coast, and it was then that his love of natural history was stimulated. However, it was not until leaving the army in 1947 that he was able to pursue his chosen avocation seriously and in that year he joined the London Natural History Society. His initial interest was ornithology and he was a frequent participant of the Society's field meetings. He was particularly attracted to the north Kent marshes with their wealth of bird life, but it was as an entomologist, and more especially as a coleopterist, that we remember him.

Derrick quickly became involved in the Society's activities. He was a frequent visitor to Bookham Common and initially contributed records on the Diptera. In 1956 and 1957 he presented a number of insects to the Society's collection, which was at that time being well used at our Eccleston Square rooms. In the latter year he became the Entomology Section's Librarian, a post that became defunct when we left Eccleston Square. In 1959 Derrick succeeded Len Parmenter as Secretary of the Entomology Section and in the same year he initiated the stag-beetle survey on behalf of the Section. The following year, 1961, he lectured on the progress of the survey and also published a first report in *The London Naturalist,* as well as contributing records to a paper on the Coleoptera of Farningham Wood. In 1961 also he was elected to Council as an ordinary member and in 1969 he became the Society's Programme Secretary. Thus in these capacities he attended Council meetings regularly from 1961 until his death.

The stag-beetle survey was well supported, not only within the Society, but nationally, and in 1964 Derrick summed up his investigations in *The London Naturalist* under the title *Distribution of the stag beetle in Britain.* Shortly after this ladybirds had been attracting a lot of attention, and the national press was frequently publishing letters and comments on the abundance of these attractive and traditionally well-liked insects. In 1968 Derrick started a survey of the ladybirds of the London Area and he published reports in 1969 and 1970 in *The London Naturalist,* and in June 1977 he contributed an article to *Country Life.* He also contributed records of beetles for the Survey of Bookham Common.

In 1960 Derrick joined the Committee of the Ecology Section. He was elected its Chairman in 1972 and held that post for two years. In 1969 he relinquished the secretaryship of the Entomology Section. The programme secretaryship was becoming more arduous (especially as meeting places were changing rather frequently) and for a while Derrick's contributions to *The London Naturalist* ceased, although he always attended the committee meetings of the now combined Ecology and Entomology Section. However, in 1977 he published in the journal the first of two papers on the Coleoptera of Bookham Common, and in the present issue his second paper appears, for which he had updated his manuscript only a few weeks before his death. In recent years the Ecology and Entomology Section has suffered from a lack of recorders and Derrick stepped in to fill the vacant posts *pro tempore.* Last year be published a list of the reptiles and amphibians for 1977, and longer reports on the mammals for 1976 and 1977.

Derrick was always ready to encourage section members and to give his services to *ad hoc* committees or working parties of Council. He always attended our indoor meetings regularly and his cheerful presence and enthusiastic contributions to discussions, both formal and informal, will be missed

After moving to Cuffley, Derrick became involved in the activities of the newly-formed Cheshunt Natural History Society and became its Treasurer and eventually its President. Although small in membership it is a flourishing society and it organises outings and lectures on a variety of topics. Derrick became particularly interested in fungi during this period and devoted a lot of time to their study.

To his widow Patricia and his young son and daughter we extend our deepest sympathy.

K. H. HYATT

RICHARD CONSTANTINE HOMES, 1913 – 1978

When Richard Constantine Homes died on 2 June 1978 after an illness of several months, the London Natural History Society lost one of its most notable personalities and one who was an accepted leader among the large number of first-rate ornithologists who graced the London scene after the end of the Second World War.

Born on 21 January 1913, Dick Homes spent his boyhood in Somerset before coming to London as a young man to take up a career in banking. He immediately joined the Society and, because he was already a competent ornithologist, he was soon appointed a recorder in the Ornithology Section. By 1936 he had been elected to Council, on which he served continuously except for the period of war service. In 1955 he was elected President for two years and subsequently a Vice-president and, in latter years, an Honorary Vice-president, a distinction he held until his death. Ornithology was Dick's primary interest, but it was his marked ability as an administrator that took him quickly to the top though he had begun modestly enough; the compiler of the *London Bird Report* for 1936, the first to be issued as a separate publication, had been R. C. Homes.

In the field, Dick's preference was for the wilder places – Norway was his favourite bird watching terrain – so it was natural that he found the salt-marshes and sheepwalks bordering the Thames between Gravesend and the Swale so congenial. Here, he and Eric Gillham collaborated on an extensive study which was published by Collins under the title *Birds of the North Kent Marshes* in 1950. The recurring pleasure Dick found in the birdlife and history of this sparsely inhabited wetland, and also on the almost derelict shingle expanse of pre-nuclear Dungeness, sprang from a romantic streak in his character not always evident when he was at his most authoritative!

After the war, ornithology had taken off and grown steadily as a popular natural history pursuit. Dick was just the man to enjoy the challenge this presented to expanding societies and, since he was prepared to accept responsibility and knew how to use it, he established himself among the leaders, not only locally, but also on a national level. The thriving state of ornithology in the capital provided the stimulus for team effort, and Dick was asked to chair the committee that was preparing a book on London's birds. He proved a splendid choice for a task that required determination and dedication. Those who shared the work with him were all busy people, but Dick's business-like methods, his persuasiveness and editorial skill, brought the project to a successful conclusion with the publication in 1957 of *The Birds of the London Area since 1900.* Though written by a committee it was, as the *New Naturalist* editors were at pains to point out, Dick's guiding hand that was responsible for the book's crisp and even style. And it was an especially appropriate monument to his endeavours since he had been our President in the two preceding years. It was also at this time, through his close association with the Royal Society for the Protection of Birds, that our Society obtained the use of rooms in the RSPB headquarters in Eccleston Square to house our library and collections.

It is a measure of the man that in this decade he undertook a staggering variety of duties in ornithological circles. Besides the contributions already noted, he was chairman of the Scientific Research Committee of the Ornithology Section for whom he organised the annual duck counts in our area, in co-operation with the Wildfowl Trust, and prepared the summaries for the *London Bird Report.* He was a founder member of the Kent Ornithological Society and did much to ensure its rapid establishment. To the British Trust for Ornithology, one of his most abiding interests, he gave enormous service; first, as regional representative for London (which helped to earn him the Bernard Tucker medal) and later as their president for two separate terms. He was also for five years on the council of the RSPB. These successes resulted because Dick combined an unusual degree of enthusiasm for scientific research in ornithology with great ability in business affairs.

After these extremely active years, the pressures of his work in the City forced him to cut down on his committees. However, he continued to exert a major influence, and when a revised edition of *The Birds of the London Area,* then out of print, was agreed with another publisher, it was inevitable that Dick should again mastermind the revision. Thus the book reappeared in 1964.

In the Ornithology Section he had undertaken pretty well every job in turn – from Recorder to Chairman – but it should not be supposed that his was an all-powerful dominance. Though of a commanding height physically, and sometimes seeming aloof, he had a genuine modesty and knew well when to defer to others and when to speak his mind. As a bird-watcher he favoured, and knew best, species from northern latitudes and, though vastly experienced, he was always ready with a touch of quiet humour to admit himself baffled by a tricky identification. On his retirement in 1972 he severed a forty-year connection with the *LBR* where he had occupied every post. His published work, apart from books, related mostly to his interest in wildfowl and in the *London Bird Report* for 1974 he contributed an important summary of 25 years of duck counts in our area.

It was a sad misfortune that Dick did not live to enjoy more than a few years of retirement, bird-watching near his Sussex home and from a caravan in Scandinavia. His many friends mourn his loss and offer to his wife and son their sincere sympathy.

Leslie Baker

RICHARD FREDERICK MOORMAN, 1898 – 1978

Richard Frederick Moorman was born on 27 April 1898 in London. He died on 26 June 1978, aged 80. He was known as 'Pat' to his friends and had been a staunch member of the Society for over 20 years. He was also a Fellow of the

Geological Society. Apart from military service in Flanders during the 1914 – 18 war, his working life was with the Westminster Bank. Most of his spare time, especially in his early days, was spent studying geology. Between the wars he joined the Isle of Wight Natural History Society and made a number of contributions to its proceedings; these included a paper on the vertebrate fossils of the Hamstead Beds. He was keenly interested in all branches of natural history, and joined the London Natural History Society first as a member of the Botany Section. However, it was to the Geology Section that he gave most of his service, and from 1963 until 1970 he acted as its Programme Secretary. He was Chairman of the section from 1970 until 1971 and for a brief period combined both posts. He served on the Council for 10 years as sectional representative. He made a number of contributions to *The London Naturalist:* these included "Some notes on the geology of Sutton and district" which appeared in 1961 and a paper on Coulsdon chalk quarry in 1963. Some of us will remember him most for enjoyable Easter weekends under his leadership at geologically exotic places, such as the Isle of Wight and Lyme Regis. The death of his wife, also a member, in 1970 was followed a year or two later by a serious deterioration in his own health, and this obliged him to go into retirement from his life-long interests. His geological collections have been presented to the British Museum (Natural History).

R. E. BUTLER

K

Book Review

Birds of Wood, Park and Garden; Birds of Sea and Coast; Birds of Lake, River, Marsh and Field; Fishes of the British and Northern European Seas; Fungi of Northern Europe 1 – Larger Fungi (excluding Gill-Fungi); Fungi of Northern Europe 2 – Gill Fungi; Plant Communities; Trees and Shrubs of the Mediterranean. Various authors. Penguin Nature Guides. *c.* 128 pp each. Penguin Books, Harmondsworth, etc. 1978. £1.95.

These titles have been translated from either Danish or Swedish originals, and have been adapted where necessary for the British reader by well-known and competent specialists. The coverage of the three bird volumes (two more are to follow) is Europe, the Middle East and north Africa. The illustrations are large, generally well executed and attractive.

Although much up to date information is packed into these slim volumes, the reviewer would, however, prefer not to pass judgement on the merits or otherwise of the series when there seem to be many similar books already on the market. We, as naturalists, have – rightly – become used to the authoritative and practical standards set by the field-guides to so many groups: birds, mammals, reptiles and amphibians, fishes, flowers, trees, etc. Nevertheless, the series will find a ready market and presumably it is aimed primarily at the beginner who will be attracted to the titles, the handy size and the fine illustrations, and it is the beginner we want to encourage.

K. H. HYATT

Statement of Affairs

	1977					
			Premises and Equipment Fund (incorporating the Hindson and Castell bequests)			
67,870			**Balance at 1 November 1977**			74,827
	253		*Add:* Investment deposit interest		55	
	38		National Savings Bank interest		118	
	3,163		Investment income received ...		3,545	
	2,869		Income tax recovered		1,641	
	1,338		Profits less losses on sales of investments		2,473	
	7,661				7,832	
	452		*Less:* Custodian's charges		525	
7,209						7,307
75,079						82,134
251			*Less:* Grant to general account			539
74,828						81,595
			Accumulated Fund			
	(2,335)		Balance, deficit, brought forward		(2,646)	
		(313)	Deficit for year—general account	(1,382)		
		—	*Less:* Transfer from Life Composition account	200		
	(313)				(1,182)	
(2,648)						(3.828)
			Other funds			
			Life Composition account			
		200	Balance at 1 November 1977	200		
		—	*Less:* Transfer against general account deficit	200		
	200				—	
			Library cataloguing fund			
	99		Balance at 1 November 1977		99	
			Plant mapping scheme : Research and publication fund			
		269	Balance at 1 November 1977	212		
		57	*Less:* Transfer to general account ..	—		
	212				212	
511						311
72,691						78.078
			Current liabilities			
	1,750		*London Naturalist* provision		1,900	
	1,750		*London Bird Report* provision		1,900	
	1,000		London bird atlas provision		—	
4,500						3.800
£77,191						£81.878

at 31 October 1978

1977			
	Assets		
70,408	**Quoted investments** at cost (Market value £82,207)		76,336
	Funds at bank and on deposit		
	National Westminster Bank Ltd.:		
1,739	Current account	253	
—	Deposit account	100	
1,250	Investment deposit account	—	
602	Investment cash — Capital	167	
89	Income	144	
3,000	National Savings Bank account	4,759	
			5,423
	Payment in advance		
—	Hire of hall for symposium 1978		88
103	**Cash in Hand**		31
£77,191			£81,878

Report of the Auditors to the members of
the London Natural History Society

We have verified the above statement of affairs and attached receipts and payments account with the books and accounts of the Society and certify them to be in accordance therewith.

Knightway House,
20 Soho Square,
LONDON W1V 6QJ
29 November 1978

NORTON KEEN & CO.
Chartered Accountants

General

1977	Payments		
384	Hire of halls, etc.		686
47	Lecturers' fees and expenses		62
251	Sectional expenses, including LNCC		350
—	Castell research centre		12
214	Library		656
37	Equipment repairs and renewals		53
48	Publicity		64
278	*Programme* printing costs		703
783	*Bulletin* and *Newsletter* expenses		13
	Provisions —		
1,750	*London Naturalist* **57**	1,900	
1,750	*London Bird Report* **42**	1,900	
			3,800
—	Mailing costs (LN **56**, LBR **41**, *Programme, Bulletin* and *Newsletter* – postage, envelopes, etc.)		920
137	Costs of services (Auditor's fees, insurance, etc.)		177
430	Honoraria		370
152	Miscellaneous postage and telephone		102
165	Miscellaneous stationery		80
33	Sundries		35
	Atlas of Breeding Birds of the London Area		
	Bulk purchase, postages, expenses	2,591	
1,000	Provision 1977	1,000	
			1,591
£7,459			£9,674

Account

1977		Receipts		
	4,066	Subscriptions – current	4,251	
	47	arrears	69	
	174	in advance	72	
	104	entrance fees	79	
4,391				4,471
308		Donations		268
179		Tax recovered from deeds of covenant		—
65		Deposit account interest		32
251		Transfer from Premises and Equipment Fund	539	
		Sale of surplus library stock	170	709
58		Transfer from plant mapping scheme		—
88		Publicity		—
		London Naturalist **56**		
		Provision 1977	1,750	
		Printing and expenses	1,705	
			45	
226		Sale of offprints	13	58
		London Bird Report **41**		
		Provision 1977	1,750	
176		Printing and expenses	1,516	234
363		Sale of journals	644	
		Less: postages	71	573
17		Subscriptions to *Bulletin*		21
—		Sundry income		2
		Altas of Breeding Birds of the London Area		
		Sales	1,370	
1,024		Royalties	554	1,924
313		Excess of payments over receipts (transferred to Accumulated fund)		1,382
£7,459				£9,674

Book Review

The Moss Flora of Britain and Ireland. By A. J. E. Smith. 706 pp, 333 text figs. Cambridge University Press, Cambridge etc. 1978. £27.50.

The need has been felt amongst British bryologists in recent years that a new moss flora was an urgent desideratum. So many species have been discovered new to the British flora, and a number new to science described, that users of Dixon's *The Student's Handbook of British Mosses* were at a disadvantage. The third and last edition of this work was published as long ago as 1924. Work on the taxonomy and nomenclature of our mosses has been so extensive during the last 30 – 40 years that Dixon's flora, excellent though it is, has long been out-of-date. Dr Smith's new moss flora is to be welcomed as a most excellent addition to our literature. It will be found to be indispensable both here, elsewhere in Europe and in North America.

Except for the genera *Campylopus, Pottia,* and *Sphagnum,* the entire text is Dr Smith's own work. The good illustrations of every species are by Mrs Ruth Smith and are spread throughout the book, which will be found most convenient. The individual descriptions are modelled on those in Clapham, Tutin, and Warburg's *Flora of the British Isles,* but salient points of difference between species are regrettably not italicised. Generic keys to species are provided, with additional keys to intraspeciefic taxa in the cases of *Ctenidium molluscum, Fissidens viridulus, Hypnum cupressiforme, Schistidium apocarpum, Tortula subulata,* etc. Much more information of the distribution of species within the British Isles and outside is given, a decided improvement on the scanty information to be found in Dixon's *Handbook.* Many of our species are absent or rare in South-east England and this is stated where necessary, a great help to beginners. The nomenclature is brought up to date and adequate synonomy quoted, so that unfamiliar specific names can easily be connected with the more usual older ones. A good number of the varieties given by Dixon have been omitted, following their omission by the late Dr Warburg when compiling the 3rd edition of the *Census Catalogue of British Mosses,* published in 1963. This is especially noticeable in the treatment of the aquatic species of *Hypnum,* and *Sphagnum* which is by M. O. Hill, a recent student of this notoriously difficult genus.

Unfortunately there are a number of misprints scattered through the book, mostly minor, but some should be corrected by the user. A list of errata has been prepared and can be supplied by Dr Smith on application. Whereas we have many angiosperms known to have been introduced into Britain during the last 300 years there appear to be only three mosses certainly known to be adventive. These include *Campylopus introflexus,* first noticed in West Sussex in 1941, and *Orthodontium lineare,* known to have come from Cape Province, South Africa, before 1920. Both these species have spread over almost all our land and across to Europe. The origin of the *Campylopus* is unknown; it could have come from Florida where it is abundant, as it is locally in Australia. The third species is *Eriopus apiculatus* from the southern hemisphere. Some other plants are possibly introductions by means unknown. These include *Hyophila stanfordensis, Tortula amplexa, T. rhizophylla,* and *Trichostomopsis umbrosa,* this latter known to have come from South America into Barcelona where it is now abundant. How did it arrive here? There is no suggestion in the flora as to whether these four species are native or not, but they are under suspicion by some of our bryologists.

This excellent new flora will deservedly be a standard work for many years. Although the price is high, it is not excessive by modern standards. The book is recommended as a necessary addition to the library of all students of the British moss flora.

E. C. Wallace

London Natural History Society
Rules

Name

1. The name of the Society shall be the LONDON NATURAL HISTORY SOCIETY.

Objects

2. Its objects shall be the study of natural history, archaeology and kindred subjects especially within twenty miles of St Paul's Cathedral, the promotion of scientific investigations, nature conservation and the publication in the Society's journals of scientific and educational papers relating particularly to the Society's Area.

Management

3. The affairs of the Society shall be managed by a Council whose members shall be the Honorary Vice-presidents and elected officers of the Society, one representative from each Section and six other elected members. The elected officers of the Society shall be:
   a) President who shall be elected for two years
   b) Vice-presidents who shall be nominated by Council
   c) Treasurer and Secretary who shall not be the same person
   d) Editors of the Society's journals
   e) Librarian
   f) such other officers as Council may at any time designate.

4. The Society may have a Patron if at any time Council shall so decide.

5. An Annual General Meeting of individual members of the Society shall be held in the month of December or thereabouts in every year to transact the following business:

a) receive and if approved adopt annual reports and a statement of the accounts to the end of the last preceding financial year

b) elect from the members of the Society the officers and members of Council, other than Section representatives

c) elect auditors

d) deal with any special matter which Council desires to bring before the members and to receive suggestions from members for consideration by Council. Nominations for election shall be submitted in writing to the Secretary at least ten days before the Annual General Meeting. The date of this meeting and the last date for nominations shall be published in the Society's programme.

6. Council shall have power to:

a) co-opt

b) fill any casual vacancy which may occur in any office or its number until the next Annual General Meeting

c) appoint Honorary Vice-presidents who shall be Honorary Members

d) appoint Honorary Members

e) appoint other officers, committees and working parties

f) regulate its own and the Society's procedure subject to these rules.

7. a) There shall be not less than four ordinary meetings of Council in any year and not more than six months shall elapse between meetings. A Special Meeting of Council shall be convened within twenty-one days upon the

requisition of not less than five members of Council addressed to the Secretary and specifying the purpose for which the meeting is to be called.

b) A notice with the Agenda for the meeting shall be sent to each member of Council at least ten days before any ordinary or special meeting of Council is to take place.

c) Ten members of Council shall form a quorum.

8. Minutes shall be taken at all formal indoor meetings of the Society including its Sections.

9. a) The President shall be ex-officio member of all working parties and committees of the Society and its Sections.

b) The Treasurer and Secretary shall be ex-officio members of all committees of the Society and its Sections (but this rule shall not apply to working parties appointed by Council for a particular purpose).

c) The President, Treasurer and Secretary shall receive notice of meetings and copies of the minutes of (a) all Committees and working parties of Council and (b) all Committees and working parties of Sections of the Society.

Finance

10. If the Office of Treasurer shall at any time become vacant the accounts shall be audited immediately.

11. The income and property of the Society and all money received by or on behalf of the Society shall be applied solely towards the furtherance, promotion and execution of the objects of the Society and no portion thereof shall be paid by way of dividend, bonus or profit to any member of the Society, provided that nothing herein expressed or contained shall prevent the payment in good faith of remuneration or expenses or both to any member of the Society, or other person or persons for services actually rendered by him or them to the Society. All claims for expenses must be sent to the Treasurer and he may require such information in regard thereto as he may think fit. All monies payable to the Society shall be received by the Treasurer or such other officer as shall be appointed to receive same. All funds belonging to the Society shall (unless invested) be deposited in banking accounts in the name of the Society or such other names as Council may authorise and no sum shall be drawn from these accounts except by cheque signed by such person or persons as Council shall direct. Any monies not required for immediate use may be invested by Council as herein authorised. Council shall cause true accounts to be kept of the receipts, expenditure, assets, credits and liabilities of the Society and shall place before members of the Society at each Annual General Meeting a properly audited Account and Balance Sheet made up to the end of the previous financial year.

Property of the Society

12. a) The Society may receive and disclaim property of any nature whether or not it is subject to any express conditions or trusts. The Society may purchase or otherwise acquire and hold property of any nature. Any property belonging to the Society may be invested in the names of not more than four or less that two Trustees who shall be appointed from time to time by Council and any vacancy amongst such Trustees shall be filled by Council. Such property may also be invested in the name of a limited company established by and under the control of the Society for trust purposes or in the name of a nominee company or with the Official Custodian for Charities. Such investments may be in or upon such shares, stocks, funds, securities, investments and property, real or personal, freehold or leasehold, movable or immovable, in any part of the world upon such terms and conditions (if any) as Council shall in its absolute discretion think fit

and in all respects as if Council were the sole beneficial owner thereof. Council may from time to time direct the Trustees to sell, vary and transfer such investments and property. Council may deal with the said investments as if it were the sole beneficial owner thereof and without prejudice to the generality of this power may borrow for the general purposes of the Society such sums as may be required by it at such a rate of interest as may be thought fit and may charge the payment of the sum upon any property of the Society and the Trustees shall give effect to any decision of Council about a loan. If legal proceedings of any kind are resorted to or defended by the Society the Trustees shall on the instruction of Council but not otherwise prosecute or defend such proceedings either in the name of the Society or in the name of the Trustees or otherwise on behalf of the Society as may be necessary. The Trustees shall in all respects act as required by Council and a copy of a Minute of Council signed by the Chairman and Secretary of the meeting be conclusive evidence of its decision.

Any Trustee may be removed from office by a Resolution passed at a meeting of Council by a vote of not less than two-thirds majority of the members of Council present and voting at the meeting. The Trustees shall be effectually indemnified by the Society from and against any liability, costs, expenses and payments whatsoever which may properly be incurred or made by them in relation to the trusts of the property and investments of the Society or in relation to any legal proceedings or which otherwise relate directly or indirectly to the performance of the function of a Trustee of the Society.

b) (1) Investments of the Society or any part or parts thereof may at any time be vested for the Society in the Official Custodian for Charities or in any public Corporation Bank or Bank Nominees Company or Trust Corporation as trustee or trustee nominee or nominees in any part of the world upon any terms and conditions including such terms as to remuneration and otherwise as the Society may agree and the Society shall not be responsible for any consequential loss.

(2) The Society shall not be bound or required to interfere in the management or conduct of the business of any company, British or foreign, in which the Society shall be interested although holding the whole or a majority of the shares carrying the control of the company but so long as there shall be no notice of any act of dishonesty or misappropriation of monies on the part of the directors having the management of such company the Society shall be at liberty to leave the conduct of its business (including the payment or non-payment of dividends) wholly to such directors and no person shall be entitled to require the distribution of any dividend by any company British or foreign in which the Society may be interested or require the Society to exercise any powers they may have of compelling any such distribution.

(3) The Society may any time or times enter into any compromise or arrangement with respect to or may release or forbear to exercise all or any of their rights as Debenture Holders Debenture Stockholders Creditors Stockholders or Shareholders of any company and whether in connection with a scheme of re-construction or amalgamation or otherwise and may accept in or towards satisfaction of all or any of such rights such consideration as they shall in their absolute and uncontrolled discretion think fit whether in the form of cash or stock shares debenture, debenture stock or obligations or securities of the same or of any other company or companies without being in any way liable or responsible for any loss resulting from any such compromise arrangement release or forbearance or in respect of any inadequacy or alleged inadequacy in the nature or amount of such consideration.

(4) The Society may pending the investment thereof place on current or deposit account with any Bank or Banks in any part of the world any cash for the time being subject to the rules of the Society and may place the securities or the documents of title to any investments for the time being subject to the rules hereof in any Bank or safe deposit in any part of the world.

(5) The Society may provide for the appointment or remuneration of trustees or nominees in any part of the world.

(6) The Society may delegate in any way and to any extent to any Trust Corporation or any two or more Trustees and wheresoever situate or resident the exercise of any of the powers of investment or management of the property for the time being forming the whole or part of the investments of the Society whether by the rules or by law.

Membership

13. a) Application for membership is open to all. Applicants shall become members after approval by Council and on payment of a first subscription and (if required) an entrance fee.

b) Any person who ceases to be a member of the Society howsoever shall automatically cease to hold any office of, or to be a member of any Committee of, the Society.

14. The following are the categories of membership:

a) ORDINARY MEMBERS

b) JUNIOR MEMBERS—persons under the age of eighteen or if receiving full-time education under the age of twenty-five. Such members pay a subscription the amount of which shall be determined by Council from time to time.

c) HONORARY MEMBERS—persons who have been appointed by Council under Rule 6(d). Such members do not pay an annual subscription and are entitled to all the privileges of ordinary membership.

d) LIFE MEMBERS—those who have paid a lump sum for membership under previous rules and enjoy the privileges of ordinary membership. No new Life Members shall be accepted.

e) FAMILY MEMBERS—members of the family of an Honorary, Ordinary or Life Member who live at the same address may become members of the Society on payment of an annual subscription of an amount determined by Council from time to time; such Family Members do not receive copies of the Society's journals.

f) SUBSCRIBER MEMBERS—other natural history societies, libraries, museums, botanical gardens, schools and similar bodies which pay the same subscription as ordinary members. They are entitled to send not more than one representative to any meeting of the Society and only accredited representatives of such bodies may vote.

g) SENIOR MEMBERS—persons over the age of 65 and who have been continuous members of the Society for ten complete years shall be entitled upon application to the Treasurer to pay a reduced rate of subscription. Such members pay a subscription the amount of which shall be determined by Council from time to time. Such members are entitled to all the privileges of membership.

15. The annual subscription payable on the first day of January and entrance fee shall be an amount recommended by Council and approved by the members at a Special General Meeting or an Annual General Meeting.

16. The annual subscription of members who first join the Society on or after the first day of October in any year shall extend to the period ending on the thirty-first day of December of the following year, but such members shall be entitled to receive copies of the Society's journals relative only to the year following that in which they joined.

17. Any member whose subscription shall be in arrears for one year on the first day of January shall cease to be a member.

18. Members of the Society whose current subscription has been paid and Honorary Members are entitled to:

a) receive a copy of the Society's journals and programmes as issued (except as provided under Rules 14(e) and 16)

b) attend all meetings of the Society and its Sections, to vote in person and to introduce visitors

c) have access to the Society's Library and Collections for borrowing or reference in accordance with arrangements laid down by Council.

19. Council may expel from the Society any member or remove from office any officer who refuses or fails to abide by these Rules or who is guilty of conduct which in its opinion is prejudicial to the Society. Every resolution for expulsion or removal must appear on the agenda and must be passed by the votes of not less than two-thirds of the members of Council present. At least ten days before any such resolution is discussed the member or officer whose conduct is in question shall be informed of the nature of the complaint and be given an opportunity of appearing before Council for the purpose of giving an explanation or denying the truth of the complaint. Every vote under this rule shall be conducted by ballot and no ballot paper shall contain any indication of the voter's name. All discussion on any resolution appearing on the agenda under this Rule shall be secret and there may only be published the name of any member who is expelled or officer removed hereunder.

Sections

20. The Society shall be constituted in such Sections as shall be sanctioned from time to time by Council which may at any time disband a section.

21. The affairs of each section shall be managed by a Committee consisting of Chairman, Secretary (who shall not also be Chairman) and not less than three other elected members.

22. The Sectional officers and members of the Committee including the representative to Council shall be elected annually at the Section's Annual General Meeting which shall be held each year before the Annual General Meeting of the Society. The Committee shall have power to fill any vacancies and to co-opt during its term of office.

23. The Committee shall meet not less than twice in any year and not more than nine months shall elapse between meetings.

24. A report recording a Section's activities during the preceding year shall be submitted for adoption by the members at the Section's Annual General Meeting. Subject to the approval of Council this report or extracts therefrom may be published in one of the Society's journals.

25. A Section shall manage its own finances from grants made by Council. A financial statement shall be submitted for adoption by the members at the Section's Annual General Meeting and a copy sent to the Treasurer who may require it to be audited.
Sections shall observe and act in conformity with any directions published by Council from time to time. Any property acquired by a Section shall be held on trust for the general objects of the Society. If any Section is disbanded its accounts shall be audited by the Society's auditors and all money, property, books and papers of which it had the use administered and directed by Council.

Special General Meetings

26. A Special General Meeting of the Society shall be convened upon the requisition of Council or of ten per cent. of the membership; such requisition shall be addressed to the Secretary, and shall specify the purpose for which the meeting is to be called. A notice shall be sent to each member of the Society at least twenty-one days before the meeting is to take place.

Alteration to Rules

27. The Rules of the Society may be altered at the Annual General Meeting or at a Special General Meeting and at least twenty-one days' notice of any meeting to consider a proposed alteration shall be given to all members. The notice shall state the proposed change or changes. In order to effect an alteration of a Rule, a majority of the members actually present and voting at the meeting shall vote in favour of the proposed change. No amendments to any proposed alteration shall be allowed.
No amendment to Rule 2 (Objects) or this Rule, or Rule 30 (Dissolution) shall take effect without the written consent of the Charity Commission thereto.

28. Any ambiguity or difference of opinion concerning the purport or interpretation of any Rule or any other matter not provided for in these Rules shall be referred to Council whose decision shall be final and binding.

Notices

29. The accidental omission to give notice of a meeting to or the non-receipt of notice of a meeting by any member shall not invalidate any proceedings or resolutions at any meeting of the Society or any Committee or Section thereof.

Dissolution

30. A motion to dissolve the Society may only be made at a Special General Meeting and to effect a dissolution at least three-quarters of the members actually present and voting at the meeting shall vote in favour of the dissolution. If a motion to dissolve the Society is carried by the said majority the Society's surplus funds, property and assets (if any) shall be disposed of for charitable purposes in connection with education and research particularly for such charitable purposes of education and research in connection with natural history as the members may at the said Special General Meeting decide to the intent that no member of the Society shall receive any of the said funds, property and assets by virtue of his membership. A statement of the reasons for advocating dissolution shall be sent to each member with the notice of the Special General Meeting.

Records and minutes

31. Records shall be taken and minutes kept in such forms as council may direct of the proceedings at all General Meetings, at all meetings of Council and of every committee, sub-committee or working party of the Society and its Sections and the minutes of every such meeting shall be confirmed at and signed by the Chairman of a subsequent meeting and when so confirmed and signed shall be conclusive as to all matters and things therein recorded and purported to have been done or directed to be done. A resolution in writing signed and agreed to by all members of Council for the time being in the United Kingdom shall be as valid and effectual as if it had been passed at a meeting of Council duly called and held and may consist of several documents in the like form each signed by one or more members of Council.

Air Pollution Overlay

by HERBERT A. SANDFORD*

This is the fourth in the series of overlays being produced to assist the study of the wildlife in the Society's Area. A full description of the scheme appears in Sandford (1972). That article includes a pocket to hold the overlays, including the Air Pollution overlay distributed with this number. The Master Grid overlay appeared with Sandford (1973).

A survey of air pollution may be as significant to an understanding of the return to London of many terrestrial species, as that of the decline of river pollution has been to the return of our native fish to the Thames (Solomon 1975).

The history of air pollution in London is well documented. Complaints have been frequent since medieval times, the earliest recorded being by King Henry III's wife, Eleanor, in 1257. By the 1280s air pollution arising from the introduction of coal as a fuel was bad enough to warrant no fewer than two special commissions. In 1578 Queen Elizabeth 1 "findeth hersealfe greately greved and anoyed with the taste and smoke of the sea-cooles" and in 1661 John Evelyn, the diarist, wrote of London as "ecclipsed with such a cloud of sulphure as the sun itself is hardly able to penetrate". Brimblecombe (1977) has constructed graphs of smoke and sulphur dioxide concentrations in London for the period 1580 to the present on the basis of historical records of coal imports. These indicate maximum concentrations to have been reached in *c.* 1880, with a steady decline since that time. Charles Dickens will therefore have experienced some of the worst pea-soupers, and most of us will remember the notorious smog of 5 – 8 December 1952, when some 4,000 premature deaths were recorded in London.

The major disaster of 1952 led eventually to the 1956 Clean Air Act which empowered local authorities to control dark smoke emissions by restricting the use of certain solid fuels in areas designated as 'smokeless zones'. No action was taken to control the other main constituent of smog, sulphur dioxide, until 1967, when regulations were introduced specifying the minimum heights of chimneys (Her Majesty's Stationery Office 1967). Both dark smoke and sulphur dioxide are declining (Fig. 1), although concentrations of the latter are still high compared with the rest of Britian and well above the World Health Organization's long-term goal of 60μg/m^3 (sixty micrograms per cubic metre) (World Health Organization 1972). A tetrad comparison of sulphur dioxide levels between the overlay for 1976 – 77 and the Department of the Environment's map for 1975 – 76 (Department of the Environment 1977), both compiled from data from the Warren Spring Laboratory, shows that the isolines ("contours") for 50μg/m^3 and 100μg/m^3 both retreated towards central London by some 4 km in a single year. The long-term trend, however, may not be of this magnitude.

Partly in order to improve understanding of the situation, the Greater London Council has recently carried out a detailed study of the sources of sulphur dioxide in London. These data are published on a monad (1 km^2) basis (Greater London Council 1979), and can be compared with the air pollution overlay.

Concerning smoke, the WHO long-term goal of 40μg/m^3 has almost been achieved (Fig. 1), but with the important exception of street-side locations where smoke from motor vehicles can give rise to much higher concentrations (Ball & Hume 1977).

---

*18 Bicton Close, Leigham, Plymouth, Devon PL6 8RN.

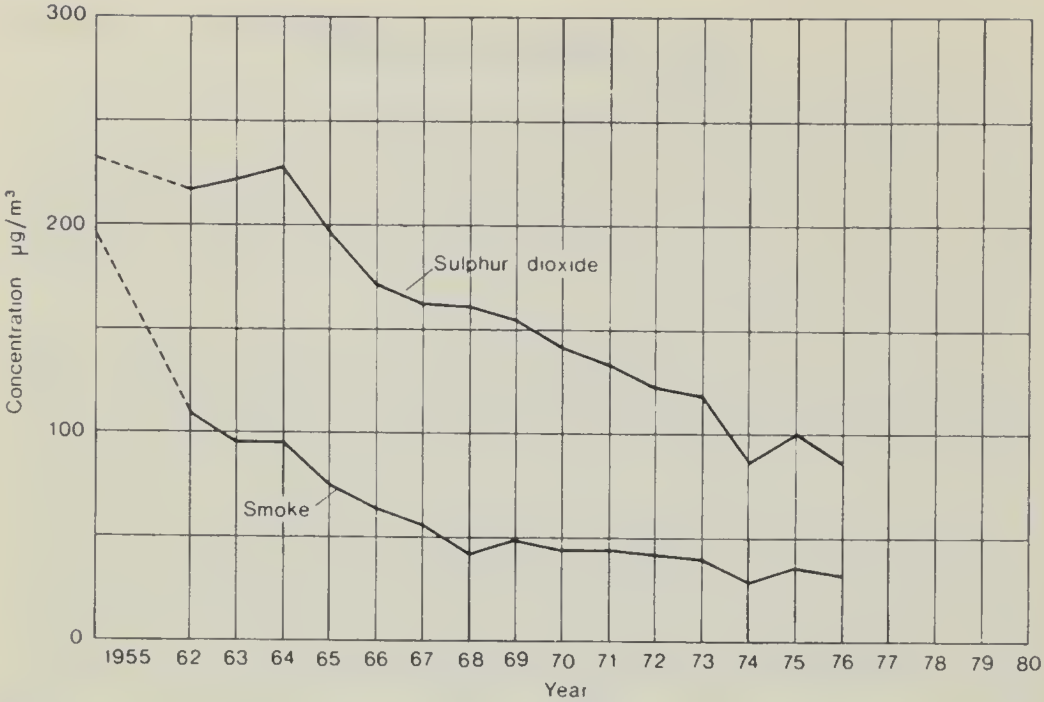


FIG. 1. Annual averages of smoke and sulphur dioxide at ground level for seven inner London national survey sites. Compiled by D. J. Ball.

There are a number of potentially damaging pollutants in the air, but only for smoke and sulphur dioxide are there enough data for mapping purposes, though this deficiency is being remedied. At today's ambient concentrations the effects of smoke on wildlife are probably small compared with those of sulphur dioxide. In considering the effects of these pollutants it may be important to take account of seasonal variations, or even daily or hourly high pollution episodes which can arise during calm weather, especially when there is a temperature inversion. Valleys are particularly affected, and under these conditions a valley that produces much pollution from traffic, houses or factories may have its polluted air trapped rather than dispersed over a wider area. A rural valley, however, may conserve its purer air during a temperature inversion while the pall of pollution drifts overhead. This could be the explanation of the survival of the yellow-green foliose lichen *Parmelia caperata* on a tree-trunk in a valley in the chalk at High Elms Park near Orpington (Rose 1973 : 78), and of the remarkable abundance of lichens in a deep valley in Lullingstone Park, Kent (Hawksworth & Rose, 1976 : 24).

Although the prevailing winds are from the south-west, the wind may blow from any quarter, and a comparison between sulphur dioxide sources and pollution suggests that the somewhat cleaner air of Surrey relative to Essex owes more to land-use than wind direction.

The most striking and best documented effects of sulphur dioxide pollution are on lichens (Laundon 1970, 1973), which are considered to be affected most during their active winter state. It is therefore appropriate to produce an overlay for ambient winter sulphur dioxide. As a very general rule the summer levels, though lower, follow approximately the same pattern as the winter levels and have a greater effect on plants and animals active in summer.

Sulphur dioxide interferes with and then destroys chlorophyll, leading to bleaching or yellowing (chlorosis) and then death (necrosis) of lichen thalli and the leaves of higher plants. Herbs are probably affected more than most woody plants, and conifers more than deciduous trees. Privet and the London plane, for instance, are good 'survivors'. Animal life is affected directly by the loss of plants upon which they depend. Lichens, for instance, provide food and shelter for many mites, springtails, grass moths, beetles and molluscs. The decline of the tree snail *Balea perversa* L. in our Area could be an example of this (Holyoak 1978). Animal life is also affected in largely unknown ways by the direct effects of sulphur dioxide: some mammals may be susceptible to respiratory complications. Wildlife may also be affected indirectly by sulphur dioxide through its contribution to the acidity of rainwater and hence of the soil pH. If this were so, it could be expected to reduce the range of calcicolous plants (although there is no evidence of this), and of certain snails. Holyoak (1978) gives this as a possible alternative explanation for the decline of the tree snail.

Other common London air pollutants which might be expected to affect wildlife are nitrogen dioxide, either on its own or in synergism with sulphur dioxide (Ashenden & Mansfield 1978), certain hydrocarbons, and photochemical oxidants such as ozone and peroxyacetylnitrate (PAN). The main source of nitrogen dioxide and hydrocarbons in London is the motor-car, and the pattern of vehicle usage can be expected to be an important factor in determining their distribution. Photochemical pollutants present a more complex picture since they are formed by the chemical reaction of nitrogen oxides and hydrocarbons in the atmosphere, in the presence of sunlight, and may be transported many miles from their place of origin by the wind. Existing evidence suggests that there are two sources of photochemical pollutants in the London area. The first is by its formation in the London plume itself, and the second by advection from the continent (Ball & Bernard 1978). Published evidence on effects in Britain is so far limited to studies of damage to the ozone-sensitive tobacco *Nicotiana tabacum* cultivar Bel-W3 (Bell & Cox 1975). However, in the light of experience in the USA it seems possible that the ozone levels occurring in London may be adversely affecting the growth of other plant species (Bell 1978).

The Air Pollution overlay attempts to show average winter ambient sulphur dioxide close to ground level for April 1976 to March 1977, the latest period for which data are available. The distribution contains some features peculiar to that winter, but long-term averages cannot be used meaningfully owing to the rapidly changing state of air pollution. The overlay is based, with permission, upon data supplied by Warren Spring Laboratory (1978) and interpreted and interpolated for the required averages on a tetrad by tetrad basis.

The help of David Ball of the Scientific Branch of the Greater London Council, and J. R. Laundon of the British Museum (Natural History), in the preparation of this paper is gratefully acknowledged.

REFERENCES

ASHENDEN, T. W. & MANSFIELD, T. A. 1978. Extreme pollution sensitivity of grasses when SO_2 and NO_2 are present in the atmosphere together. *Nature* 273 : 142 – 143.

BALL, D. J. and BERNARD, R. E. 1978. An analysis of photochemical pollution incidents in the Greater London area with particular reference to the summer of 1976. *Atmospheric Environment* 12 : 1391 – 1401.

BALL, D. J. & HUME, R. 1977. The relative importance of vehicular and domestic emissions of dark smoke in Greater London in the mid-1970s. *Atmospheric Environment* 11 : 1065 – 1073.

BELL, J. N. B. 1978. Ozone in the environment. *Biologist* **25** (1): 279 – 287.

BELL, J. N. B. & COX, R. A. 1975. Atmospheric ozone and plant damage in the United Kingdom. *Environ. Pollut.* **8** : 163 – 170.

BRIMBLECOMBE, P. 1977. London air pollution, 1500-1900. *Atmospheric Environment* **11** : 1157 – 1162.

DEPARTMENT OF THE ENVIRONMENT. 1977. *United Kingdom Winter Mean Concentrations of SO_2 1975 – 6.* HMSO, London.

GREATER LONDON COUNCIL 1979. *Greater London's Air Pollutant Emission Inventory.* GLC Research Report No. – GLC, London.

HAWKSWORTH, D. L. & ROSE, F. 1976. *Lichens as Pollution Monitors.* Studies in Biology **66.** Arnold, London.

HER MAJESTY'S STATIONERY OFFICE. 1967. *Chimney Heights – Second Edition of the 1956 Clean Air Act.* HMSO, London.

HOLYOAK, D. T. 1978. Effects of atmospheric pollution on the distribution of *Balea perversa* Linnaeus (Pulmonata: Clausiliidae) in southern Britain. *J. Conch. Lond.* **29** : 319 – 323.

LAUNDON, J. R. 1970. London's lichens. *Lond. Nat.* **49** : 20 – 69.

LAUNDON, J. R. 1973. Changes in the lichen flora of Bookham Commons with increased air pollution and other factors. *Lond. Nat.* **52** : 82 – 92.

ROSE, F. 1973. Detailed mapping in south-east England. *In* FERRY, B. W., BADDELEY, M. S. and HAWKSWORTH, D. L. (Editors) *Air Pollution and Lichens.* Pp 76 – 88. Athlone Press, London.

SANDFORD, H. A. 1972. Recording maps and overlays. *Lond. Nat.* **51** : 20 – 21.

SANDFORD, H. A. 1973. Master grid overlay. *Lond. Nat.* **52** : 155.

SOLOMON, D. J. 1975. The decline and reappearance of migratory fish in the tidal Thames with particular reference to the salmon, *Salmo salar. Lond. Nat.* **54** : 35 – 37.

WARREN SPRING LABORATORY. 1978. *The Investigation of Air Pollution. National Survey Smoke and Sulphur Dioxide, April 1976 – March 1977.* Department of Industry, Stevenage.

WORLD HEALTH ORGANIZATION. 1972. *Air Quality Criteria and Guides for Urban Air Pollutants.* Technical Report Series **506.** WHO, Geneva.

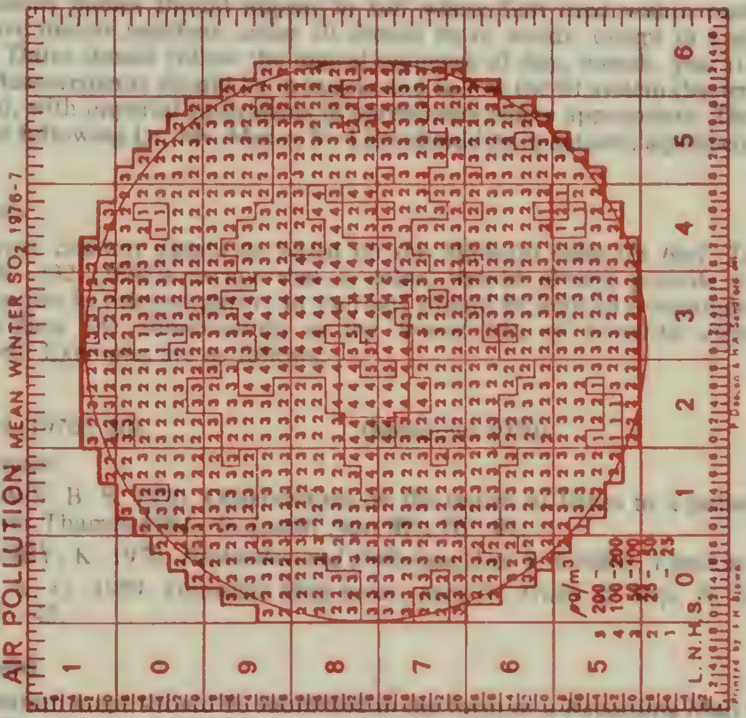
Instructions to Contributors

Submission of papers

[illegible] ould be [illegible] Museum [illegible] if they [illegible] double [illegible] retain a [illegible] ynopsis.

Text

[illegible] locality [illegible] Survey. [illegible] nts must [illegible] en both [illegible] parating [illegible] aph. In [illegible] merical [illegible] cember [illegible] national [illegible] d be no [illegible] merical [illegible]



References

[illegible] t. Club [illegible] umber. [illegible] al titles [illegible] and be [illegible]

[illegible] B [illegible] tary of [illegible]

[illegible] K [illegible]

[illegible] d Club [illegible]

Illustrations

[illegible] bols in [illegible] esence, [illegible] oduced [illegible] a line [illegible] of 0·5 [illegible] by the [illegible] dies for printing distribution symbols.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Legends should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

Proofs

Galley proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

Reprints

Up to 25 free reprints will be supplied on request. Additional copies may be purchased if ordered when the proofs are returned.

BELL, J. N. B. 1978. Ozone in the environment. *Biologist* **25** (1): 279 – 287.

BELL, J. N. B. & COX, R. A. 1975. Atmospheric ozone and plant damage in the United Kingdom. *Environ. Pollut.* **8** : 163 – 170.

BRIMBLECOMBE, P. 1977. London air pollution, 1500-1900. *Atmospheric Environment* **11** : 1157 – 1162.

DEPARTMENT OF THE ENVIRONMENT. 1977. *United Kingdom Winter Mean Concentrations of SO_2 1975 – 6.* HMSO, London.

GREATER LONDON COUNCIL 1979. *Greater London's Air Pollutant Emission Inventory.* GLC Research Report No. – GLC, London.

HAWKSWORTH, D. L. & ROSE, F. 1976. *Lichens as Pollution Monitors.* Studies in Biology **66**. Arnold, London.

HER MAJESTY'S STATIONERY OFFICE. 1967. *Chimney Heights – Second Edition of the 1956 Clean Air Act.* HMSO, London.

HOLYOAK, D. T. 1978. Effects of atmospheric pollution on the distribution of *Balea perversa* Linnaeus (Pulmonata: Clausiliidae) in southern Britain. *J. Conch. Lond.* **29** : 319 – 323.

LAUNDON, J. R. 1970. London's lichens. *Lond. Nat.* **49** : 20 – 69.

LAUNDON, J. R. 1973. Changes in the lichen flora of Bookham Commons with increased air pollution and other factors. *Lond. Nat.* **52** : 82 – 92.

ROSE, F. 1973. Detailed mapping in south-east England. *In* FERRY, B. W., BADDELEY, M. S. and HAWKSWORTH, D. L. (Editors) *Air Pollution and Lichens.* Pp 76 – 88. Athlone Press, London.

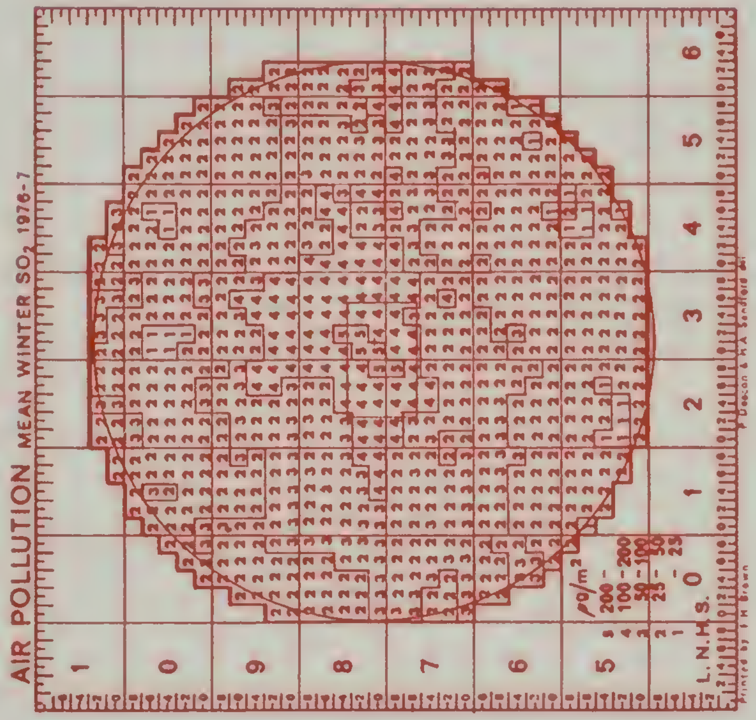
SANDFORD, H. A. 1972. Recording maps and overlays. *Lond. Nat.* **51** : 20 – 21.

SANDFORD, H. A. 1973. Master grid overlay. *Lond. Nat.* **52** : 155.

SOLOMON, D. J. 1975. The decline and reappearance of migratory fish in the tidal Thames with particular reference to the salmon, *Salmo salar. Lond. Nat.* **54** : 35 – 37.

WARREN SPRING LABORATORY. 1978. *The Investigation of Air Pollution. National Survey Smoke and Sulphur Dioxide, April 1976 – March 1977.* Department of Industry, Stevenage.

WORLD HEALTH ORGANIZATION. 1972. *Air Quality Criteria and Guides for Urban Air Pollutants.* Technical Report Series **506**. WHO, Geneva.


AIR POLLUTION MEAN WINTER SO$_2$ 1976-7
μg/m³
5 200 -
4 100 - 200
3 50 - 100
2 25 - 50
1 - 25
L. N. H. S.
1
0
9
8
7
6
5
0
1
2
3
4
5
6
Printed by I H Brown
P Deacon & M.A Sandford del

BELL, J. N. B. 1978. Ozone in the environment. *Biologist* **25** (1): 279 – 287.

BELL, J. N. B. & COX, R. A. 1975. Atmospheric ozone and plant damage in the United Kingdom. *Environ. Pollut.* **8** : 163 – 170.

BRIMBLECOMBE, P. 1977. London air pollution, 1500-1900. *Atmospheric Environment* **11** : 1157 – 1162.

DEPARTMENT OF THE ENVIRONMENT. 1977. *United Kingdom Winter Mean Concentrations of* SO_2 *1975 – 6.* HMSO, London.

GREATER LONDON COUNCIL 1979. *Greater London's Air Pollutant Emission Inventory.* GLC Research Report No. – GLC, London.

HAWKSWORTH, D. L. & ROSE, F. 1976. *Lichens as Pollution Monitors.* Studies in Biology **66**. Arnold, London.

HER MAJESTY'S STATIONERY OFFICE. 1967. *Chimney Heights – Second Edition of the 1956 Clean Air Act.* HMSO, London.

HOLYOAK, D. T. 1978. Effects of atmospheric pollution on the distribution of *Balea perversa* Linnaeus (Pulmonata: Clausiliidae) in southern Britain. *J. Conch. Lond.* **29** : 319 – 323.

LAUNDON, J. R. 1970. London's lichens. *Lond. Nat.* **49** : 20 – 69.

LAUNDON, J. R. 1973. Changes in the lichen flora of Bookham Commons with increased air pollution and other factors. *Lond. Nat.* **52** : 82 – 92.

ROSE, F. 1973. Detailed mapping in south-east England. *In* FERRY, B. W., BADDELEY, M. S. and HAWKSWORTH, D. L. (Editors) *Air Pollution and Lichens.* Pp 76 – 88. Athlone Press, London.

SANDFORD, H. A. 1972. Recording maps and overlays. *Lond. Nat.* **51** : 20 – 21.

SANDFORD, H. A. 1973. Master grid overlay. *Lond. Nat.* **52** : 155.

SOLOMON, D. J. 1975. The decline and reappearance of migratory fish in the tidal Thames with particular reference to the salmon, *Salmo salar. Lond. Nat.* **54** : 35 – 37.

WARREN SPRING LABORATORY. 1978. *The Investigation of Air Pollution. National Survey Smoke and Sulphur Dioxide, April 1976 – March 1977.* Department of Industry, Stevenage.

WORLD HEALTH ORGANIZATION. 1972. *Air Quality Criteria and Guides for Urban Air Pollutants.* Technical Report Series **506**. WHO, Geneva.

Instructions to Contributors

Submission of papers

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr J. R. Laundon, Department of Botany, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include at the beginning an abstract, summary or synopsis.

Text

Spellings are to follow *Chambers Twentieth Century Dictionary* 1972 edition; locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalisation should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. Genus names should appear in full where first used within each paragraph. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

References

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* 22 : 130 – 132 (1895)) except that a colon should always precede a page number. Capitalisation in titles of papers in journals should be kept to a minimum. Journal titles should follow the abbreviations in the *World List of Scientific Periodicals* and be underlined. Examples are as follows:

In text:

Meadows (1970 : 80). (Meadows 1970)

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964 – 9. *Lond. Nat.* **49** : 76 – 81.

MELLANBY, K. 1970. *Pesticides and Pollution*. Ed. 2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* 92 : 39 – 45.

Illustrations

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4·0 mm and tetrad crosses 5·0 mm, with a line thickness of 0·8 mm; all monad symbols should be 1·6 mm with a line thickness of 0·5 mm. The legend should be written outside the frame of the map and will be set up by the printer. The Mapping Schemes Secretary can provide Recording Maps, advice and dies for printing distribution symbols.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Legends should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

Proofs

Galley proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

Reprints

Up to 25 free reprints will be supplied on request. Additional copies may be purchased if ordered when the proofs are returned.

The London Naturalist

No. 58 **1979**

Frontispiece: Shad Thames 2

Officers for 1979 3

Contents 4

Report of the Society for 1978 5

HARRISON, C. J. O.—Pleistocene birds from Swanscombe, Kent 6-8

BURTON, R. M.—*Bidens* in Britain 9-14

DAVIS, B. N. K.—The ground arthropods of London gardens 15-24

STILES, D.—The common wall lizard *Podarcis muralis* in Middlesex 25-26

PLANT, C. W.—The status of the hedgehog *Erinaceus europaeus* in the London Boroughs of Barking, Newham, Redbridge and Waltham Forest 27-37

Survey of Bookham Common: thirty-seventh year
Progress report for 1978 38-43

HILLMAN, ELLA M.—A study of *Ruscus aculeatus* on Bookham Common 44-55

HALL, D. G.—A further contribution to the Coleoptera of Bookham Common 56-58

SMALL, L. M. PEARL—Conservation in the London Area 1978 60-61

BURTON, R. M.—Botanical records for 1978 62-68

KING, PETER W.—Amphibia and Reptilia in the London Area 1978 69-70

COTTON, J.—Mammals in the London Area 1978 71-73

Obituaries:

Derrick Gordon Hall, 1923 – 1978 74-75

Richard Constantine Homes, 1913 – 1978 75-76

Richard Frederick Moorman, 1898 – 1978 76-77

Statement of affairs at 31 October 1978 78-81

London Natural History Society Rules 83-88

Book reviews 8, 26, 37, 43, 59, 77, 82

SANDFORD, HERBERT A.—Air pollution overlay 89-92

© London Natural History Society 1979

c/o British Museum (Natural History), Cromwell Road,
London SW7 5BD

Published November 1979

Riley Dunn & Wilson Ltd
EXPERT CONSERVATORS & BOOKBINDERS